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ENTOMOLOGY.—*Notes on the American representatives of the butterfly genus* Argynnis.[1] AUSTIN H. CLARK, U. S. National Museum.

The problem of the interrelationships of the numerous forms of the genus *Argynnis* occurring in North America is an interesting one. In sharp contrast to the various species of Europe and Asia, we find among the American species extraordinary similarity in fundamental characters of structure and in color pattern, combined with an equally extraordinary diversity in details. Characteristic of all the American argynnids, with the exception of *A. diana*, are the arrangement and relative size of the spots on the under side of the hind wings, although they may or may not be silvered, and the ground color of the wings may be green or brown of various shades, yellow, or even deep purple, uniform or more or less mottled or variegated with lighter or darker, from sharply to only vaguely contrasting with the spots, and with or without a broad or narrow light marginal band. Especially noteworthy in the American argynnids is the entire absence on the under side of the hind wings of the submarginal row of eye spots, which, more or less developed, occurs in very nearly all the Old World species no matter how much the rest of the color pattern may differ. These eye spots, sometimes reduced to dots, are equally characteristic of the species of the genus *Brenthis* and are present in all the American forms in that group.

The only European and Asiatic species of *Argynnis* that lack all traces of these eye spots are *aglaia*, *elisa*, *clara*, and *alexandra*. In *aglaia* not only are these spots lacking, but the color pattern above and below resembles that characteristic of the American forms. On the under side of the hind wings the spots are of the same shapes and proportions as the corresponding spots in the American forms, and the light band between the marginal and inner rows of spots found in nearly all the American forms is present in most of the numerous races.

[1] Published with the permission of the Secretary of the Smithsonian Institution
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Argynnis aglaia ranges from the British Isles and most of Europe and Asia Minor eastward throughout Asia as far south as Kashmir and northwestern India to eastern Asia and Japan. It is divisible into a number of local races or subspecies that differ considerably in size and in color, especially in the ground color of the under side of the hind wings. Wherever this butterfly occurs it is abundant, or at least common.

Under the name of *washingtonia* Drs. Barnes and McDunnough have described a form from British Columbia and Washington that does not seem to differ in any tangible character from *A. aglaia* as it occurs in eastern Asia. There is an average difference in specimens from the two regions, but in all characters they appear to intergrade. The American specimens may usually be distinguished by the presence of a silver dash on the under side of the hind wings near the narrowly silvered abdominal border about halfway from the base to the anal angle. This silver dash is typically absent in Asiatic specimens, but traces of it occur in some from Si-Gong-Kong, near Tatsien-Lu, and from Tang-Gu, and in one at hand from Tang-Gu it is well developed.

There can be no doubt that *washingtonia* is simply an American representative of the European and Asiatic *A. aglaia*, and that it should be included in our lists as *Argynnis aglaia washingtonia*. Here, however, we encounter one of those conflicts between systematic zoölogy and taxonomy that tend to obscure a true appreciation of the interrelationships of animal types. In Dr. McDunnough's latest list *washingtonia* is given as one of the six subspecies of *A. eurynome* Edwards, the other five being *eurynome, bischoffi, opis, artonis*, and *luski*. Now although *eurynome* was the first of these to be described, *washingtonia*, not specifically distinct from the Old World *aglaia*, is undoubtedly the basic form from which the others were locally derived, if it is assumed that these six forms are really subspecifically related.

It appears reasonable to consider that, in spite of their diversity, they are closely related. Their interrelationships are, however, of a nature quite different from those between *aglaia* and its European and Asiatic subspecies. They involve curious and unusual factors such as the paling of the under side of the hind wings in *artonis*, which reaches an extreme and is combined with partial obliteration of the spots in *opis*, and a paling of the ground color to a light dull yellow on which the position and shape of the spots is indicated by narrow dark outlines in *luski*. It would appear possible to regard

these strange variants from the *aglaia–washingtonia* type as forms that have arisen by mutation quite independently of their immediate surroundings and have become locally established either in the same area as the stem form or in different areas, rather than as the usual type of subspecies which is a modification, by mutation or otherwise, of a specific type in more or less definite, or at least assumed, response to local ecological conditions.

If this hypothesis be acceptable it can be expanded and broadened to cover all the American argynnids, which would then be interpreted as fundamentally mutants from the highly plastic *aglaia* stock. Some of these mutants, as *A. cybele*, *A. aphrodite*, and *A. atlantis*, are stable entities and, ranging widely, have developed local races or subspecies of the usual type. Others, in the Southwest and Southeast at the maximum distance from the territory inhabited by *A. aglaia washingtonia*, are highly aberrant, like *A. caerulescens* and *A. diana*, which, except in color, do not differ essentially from *A. cybele*, and *A. idalia*.

With wide departures from the normal in color are associated curious ecological characteristics. Both *Argynnis diana* and *A. idalia* have a very wide range within which neither shows any noticeable tendency to form local races. *Argynnis diana* is strictly a woodland form occurring only in warm regions but always near cold water, either cold mountain streams or extensive cold seepages as along the western border of the Dismal Swamp. On the other hand, *A. idalia* is confined to open grass lands, moist meadows in the lowlands and open pastures in the southeastern mountains.

The interpretation of our American argynnids as primarily derivatives, mostly by more or less abrupt mutation, from *aglaia* stock represented in North America by *washingtonia* would explain the close similarity in the fundamental features upon which is superimposed extraordinary diversity in detail. It would also explain the curiously involved character of their interrelationships which makes it practically impossible to arrange them in any logical and convincing systematic pattern.

Among the species of the related genus *Brenthis* there are certain points that should be brought out.

The common North American species known as *myrina*, including the several recognized subspecies, is, taken as a whole, indistinguishable from the widespread and variable *selene* of Europe and Asia. The most constant difference between the Old World forms grouped under the name of *selene* and the American forms collectively considered as *myrina* is found in the black central dot in the spot occupy-

ing the greater part of the cell on the under side of the hind wing. In *selene* this dot is large and is typically not ringed with lighter. In *myrina* it is small and is ringed more or less completely with silver or with light yellow. But even this character is undependable. A specimen of *selene* at hand from Rennes, France, in this as in other features is almost an exact duplicate of another from Tolland, Colo., and if the place of origin were unknown it would certainly be referred to the form *tollandensis*. A specimen from Hopedale, Labrador, is very close to others from northern Europe and perhaps should be referred to the same subspecies.

The North American forms now grouped under *Brenthis myrina* should be listed as:

Brenthis selene myrina (Cramer)
Brenthis selene atrocostalis Huard
Brenthis selene terrae-novae Holland
Brenthis selene nebraskensis Holland
Brenthis selene tollandensis Barnes and Benjamin
Brenthis selene marilandica, subsp. nov.

Brenthis selene marilandica, subsp. nov.

Diagnosis.—Resembling *Brenthis selene myrina* but larger, the fore wings 22–25 (averaging 23.75) mm in length, and with the ground color above darker and more reddish and the black markings broader and heavier, often much heavier so that they are more or less extensively confluent; on the under surface the color varies from about as dark as in the darkest *myrina* (from Massachusetts) to very appreciably richer, with the black markings on the under side of the fore wings always heavier.

Type.—From the boggy pasture on the south side of the road from the Beltsville, Md., railway station to the Department of Agriculture experiment farm, collected by Austin H. Clark on July 6, 1929 (U.S.N.M. no. 55470, figured in U. S. Nat. Mus. Bull. 157, pl. 3, figs. 5, 6, 1932).

Remarks.—This form has only a single brood, flying from the end of June (earliest date June 29) to about the end of July. In the past it was rather common in the type locality, but it has not been found in recent years. No other locality for it is known. The common form of this species in Maryland and in western Virginia is *myrina*.

ENTOMOLOGY.—*Five new Guatemalan scarab beetles of the genus* Phyllophaga.[1]

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Opportunity is taken herewith to characterize five new species of Scarabaeidae from Guatemala. All belong to the genus *Phyllophaga* Harris (subgenus *Phyllophaga*), and the holotypes of all are in the author's collection.

[1] Received May 13, 1941.

Phyllophaga (Phyllophaga) duenas, n. sp.

Male.—Oblong-ovate, slightly wider behind; color rufocastaneous, faintly pruinose above; dorsal surface griseopilose. Clypeus moderately long, the apex truncate, entire, and slightly reflexed, with the angles broadly rounded; disk very densely and coarsely punctate. Front coarsely scabrose, with long erect hairs. Antennae 10-segmented, rufotestaceous; club ovate, equal in length to segments 3–7 combined. Thorax with sides dilated, ciliate, hardly crenulate, straight before the dilation and slightly sinuate behind; front angles subrectangular, hind angles obtuse; disk with very dense and fine punctures, each separated by about its own diameter, those in apical half and at sides faintly scabrose and very slightly larger, all discal punctures with short, suberect, griseous pile and a few slightly longer hairs near center apex. Elytra ecostate, sutural costa not well defined; disk with the fine, dense punctures separated by once their diameters, and all with short, suberect, griseous hairs, with a few longer hairs near base of disk. Pygidium slightly convex, pruinose, and punctured like the elytra, with very short suberect hairs mixed with short erect hairs, apex reflexed and slightly thickened. Abdomen pruinose, flattened, slightly longitudinally impressed, surface very finely and densely punctate, with short procumbent hairs; fifth sternite faintly, lobately produced at midapical margin, disk flat and with a dense median patch of small granules and short hairs; sixth sternite half the length of fifth, the basal margin thickened and carinate with the middle base lobately reflexed toward the apical margin and the apex of this lobe forming a somewhat broad transverse carina that is slightly tumid at each end; apical margin carinate, though narrowly interrupted at the middle, and ciliate; disk densely and finely punctate, with long erect hairs. First segment of hind tarsus shorter than second; spurs free. Claws with basal tooth submedian in position and a little broader and longer than apical tooth, also faintly reflexed toward the base; claw base broad and very obtusely dilated. Length 16.5 mm.

The unique male holotype, in the Saylor collection, is from "Duenas, Guatemala." The species is related to *P. abdominalis* Moser, but the sixth abdominal sternite is quite different and the abdomen is slightly impressed.

Phyllophaga (Phyllophaga) nepida, n. sp.

Male.—Robust-oval, wider behind; color piceocastaneous, thorax dull and faintly pruinose, dorsal surface haired. Clypeus short, transverse, and nearly rounded, the apex entire and slightly reflexed, the angles hardly indicated; disk densely, coarsely, and setigerously punctate. Front densely and coarsely punctured, with short erect hairs. Thorax with sides slightly dilated, ciliate, entire, and subparallel behind, angles obtuse but well indicated; disk evenly punctate, with moderately coarse, dense, variolate punctures, each separated by more than once its diameter on disk, though closer at sides, and each with a short suberect hair; front margin with long cilia. Elytra, except for the sutural rib, ecostate; disk densely punctured, as thorax, with short, suberect, griseous pile and a few longer intercalated hairs on suture and near base. Pygidium slightly convex, polished, basal half pruinose; disk densely and coarsely punctate, with short erect hairs of two lengths; apex truncate and ciliate. Abdomen pruinose, flattened, and faintly longitudinally sulcate at middle; fifth sternite declivous at apex, with a large patch of granules at middle and short erect hair; sixth nearly as long as fifth, transversely flattened and subgranulately punctate, with a faint, smooth, longitudinal impression; the basal margin somewhat thickened and subcarinate, though interrupted at middle. First segment of hind tarsus shorter than second;

spurs free. Claws short, robust, basal tooth short and triangular and slightly basad of middle, the base hardly dilated. Genitalia of the bilaterally symmetrical, complete, ring-shaped type; in *en-face* view the lateral angles are moderately long, very sharp, and somewhat convergent toward the center, the center underpiece well indicated and divided into two sharp, subparallel, slender teeth.

Female.—Antennal club ovate and equal in length to segments 3–7 combined; the front thoracic angles rectangular and the hind angles nearly so; elytra with very sparse longer hairs all over the surface, those at base somewhat thicker than corresponding hairs of the male; pygidium more flattened and a little more coarsely punctate in apical half; abdomen flattened, the fifth and sixth sternites plane and densely and setigerously punctate; otherwise similar to male. Length 14–15 mm.

The holotype male, allotype female, and paratype female, which remain in the Saylor collection, are from "Finca San Juan, Alta Vera Paz, Guatemala." They were collected by Felix A. Muenchmeyer. This species is near *P. wittkugeli* Nonfried but differs in the male genitalia and the dorsal sculpture.

Phyllophaga (Phyllophaga) ferupilis, n. sp.

Male.—Elongate-subparallel; color rufocastaneous and slightly shining, above entirely griseopilose. Clypeus long, flat, nearly trapezoidal, the apex subtruncate and entire, the angles narrowly rounded; disk very coarsely and densely punctate, with erect hairs. Front coarsely and contiguously punctate, with short erect pile. Antennae 10-segmented, rufous; club very long, subequal in length to the entire stem; segments 5–7 with short spines on the inner apical margin. Thorax, elytra, and pygidium with extremely fine and extremely dense punctures over the entire surface, with short procumbent hairs; on the elytra adjoining the scutellum there are several longer hairs, which, however, are still rather fine. Thorax with the sides dilated in front of middle, ciliate, entire in front and crenate behind the dilation; angles obtuse but angulate. Elytra with a strong membranous margin, the sutural costa weakly indicated; sutural costae hardly obvious at base and apex. Pygidium faintly convex, its apex subrounded and reflexed. Abdomen punctured and haired like the elytra, its center flat; fifth sternite very slightly prolonged at middle of the apical margin into a small lobe, disk with a dense patch of fine granules; sixth sternite half the length of fifth, transversely sulcate and punctate, basal margin much thickened and subcarinate, especially at the middle, where there is a very small, triangular, apical gibbosity, which is impressed at center and slightly granulate each side; apical margin of sixth sternite carinate and ciliate and interrupted at the middle. First two hind tarsal segments subequal, the spurs free and very graceful. Claws with a sharp basal tooth, which is median in position and of nearly same size and length as apical tooth; claw base angularly dilated but obtuse. Genitalia bilaterally symmetrical; in lateral view the lateral margins are greatly rounded and overhang the small and bidentate median underpiece. Length 24.5 mm.

The unique male holotype, in the Saylor collection, was collected by Felix A. Muenchmeyer at "Finca San Juan, Alta Vera Paz, Guatemala." The species is near *P. ferrugata* Moser but is much larger, and the abdominal characters are distinct.

Phyllophaga (Phyllophaga) totonis, n. sp.

Male.—Oblong-ovate; color castaneous, shining, head and thorax piceocastaneous; hairy above. Clypeus moderately long, apex hardly reflexed,

very narrowly but distinctly emarginate, the angles very broadly rounded, disk with coarse, dense, setigerous punctures. Front very densely, coarsely, and scabrosely punctate, with very long brownish hair. Antenna 10-segmented, rufobrunneous; club long, about one-fourth longer than funicle but hardly as long as the entire stem. Thorax with sides strongly dilated, with long cilia, straight before dilation and noticeably sinuate behind it, the margins subcrenate; front angles obtuse, hind angles distinctly rectangular; disk with dense, moderately coarse, umbilicate punctures, each separated by once its diameter, or slightly more, somewhat closer at sides, all punctures with very long erect hairs and without intercalated shorter hairs; an area of disk at each lateral dilation, and along base each side of the middle to the hind angles, smooth and impunctate. Scutellum impunctate. Elytra with sutural stria strong and with a moderately indicated, oblique first discal stria, which becomes progressively wider toward the apex, where it is evanescent; disk rugose, punctures small, irregularly and not densely placed, with very long hair near scutellum and along lateral margins, the disk with a few short, scattered hairs. Pygidium convex, polished; disk rugose, the punctures very fine and dense and with fine erect hair of short to moderate length; apex widely subrounded. Abdomen flattened, highly polished, middle glabrous and very finely and sparsely punctate; fifth sternite somewhat declivous behind, basal fourth smooth, apical portion with a small patch of fine dense punctures; sixth sternite faintly longer than fifth, widely shallowly foveate, the disk densely and finely subgranulate and punctate at sides with long erect hairs. First segment of hind tarsus a little shorter than second. Claw widely cleft, the upper tooth nearly twice as broad as apical and apex obliquely truncate; both teeth of approximately the same length; claw base distinctly though obtusely dilated. Genitalia bilaterally symmetrical, the lateral lobes free at apex though touching; in *en-face* view the lateral lobes have each a short thumblike lobe at the middle projecting upward, and at the lower apex each lateral lobe is very broad and the apex is emarginate, the two blunt inner lobes touching or slightly overlapping at the center. Length 13.5 mm.

The unique male holotype, in the Saylor collection, is from "Quicke Totonicapan, Guatemala, May." The species is near *Phytalus xanthocomus* Bates but differs in the pygidial characters and antennal length. From *P. castaneipennis* Moser, *totonis* differs in the clypeal form and in the elytral characters.

Phyllophaga (Phyllophaga) mentalis, n. sp.

Male.—Oblong-oval, widest behind; color rufotestaceous and strongly shining, head and thorax rufous; very nearly glabrous above. Clypeus flat and very broad; apex slightly reflexed and very narrowly sinuate at middle; the angles very broadly rounded; disk with somewhat coarse, moderately dense, irregularly placed punctures. Front sparsely punctate like the clypeus, with very sparse, short, erect hairs near sides. Vertex impunctate. Antenna 10-segmented, rufotestaceous; club ovate and minute, scarcely equal in length to segments 5–7 combined. Thorax with sides arcuate, nearly entire, and slightly ciliate, the angles rounded; base not margined at middle; front margin thickened and slightly sinuate; disk with somewhat coarse, moderately dense punctures, which are slightly less dense at center. Scutellum punctate. Elytra with two discal striae, other than sutural, weakly indicated; disk punctured as thorax but a little more densely and more irregularly so. Pygidium polished, slightly convex, glabrous, disk punctured like the thorax, the punctures a little finer. Abdomen convex, highly polished, and very finely not densely punctate at middle, with a few short scattered

hairs; fifth sternite no different from third and fourth; sixth sternite three-fifths the length of fifth and widely transversely impressed, the apex and base slightly thickened, carinate, and not interrupted, except very narrowly at apex; disk of sixth sternite wrinkled and not obviously punctate, apparently glabrous and with a very fine longitudinal sulcus. First segment of hind tarsus slightly shorter than second; spurs free. Claw very short and robust, the basal tooth very small, short, and strongly inclined toward, but narrowly separated from, the weakly dilated claw base. Mid and hind tibiae each with several small serrations on the outer margin. Labrum large, very deeply and narrowly cleft to base. Mentum very deeply and longitudinally sulcate. Length 19 mm.

The unique male holotype, in the Saylor collection, is from "Trece Aquas, Cacoa, Guatemala." The species appears to be quite different from any known to me in a number of characters but somewhat approaches *P. parvicornis* Moser, from which it may be separated by the different abdominal structure, densely punctate pygidium, and punctate scutellum.

ZOOLOGY.—*Notes on Mexican snakes of the genus* Masticophis.[1]

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The following notes are based on the Mexican whipsnakes in the U. S. National Museum (to which specimen numbers refer, unless otherwise indicated), and on a portion of the E. H. Taylor-H. M. Smith Mexican collection. I am much indebted to Dr. E. H. Taylor for loan of material and other courtesies too numerous to mention. A portion of the specimens were collected during my tenure of a Walter Rathbone Bacon Traveling Scholarship, of the Smithsonian Institution.

Masticophis mentovarius (Duméril and Bibron)

Eleven Mexican specimens are from the following localities: CHIAPAS: Tonalá (no. 111270); near Colonia Soconusco (no. 111269). OAXACA: Juchitán (no. 30231); Tehuantepec (nos. 30422–3, 111274–6); Cerro de Huamelula (no. 111272); Mixtequilla (no. 111271); Cerro Arenal (no. 111273). One in the EHT-HMS collection is from Rodriguez Clara, Veracruz (no. 5494).

All have seven labials, but in two the subocular labial (fourth) is partially split. A juvenile (Veracruz), measuring 448 mm in total length (tail 110 mm), has a narrow light stripe along adjacent edges of the third and fourth scale rows, mostly on the third; a similar stripe, a little more distinct, is on the adjacent edges of the first and second scale rows. Both stripes become very faint posteriorly and completely disappear at about the middle of the body.

This species, because of the rudimentary nature of the light stripes, presence of dark spots on the scales, absence of any marked peculiarity in pattern, and its geographical position, appears to represent the nearest approach to the ancestral type of pattern in the genus. From it all other pattern types of the genus may be derived, as a northward radiation of vicariating forms in three series. With *mentovarius* as the starting point, two primary series are evident: one in which cross bands are present and one in which stripes are

[1] Received April 10, 1941.

developed. The latter soon splits, to give rise to the 15-scale row series, as opposed to the primitive, 17-scale row type. The pattern in the most primitive 15-scale row form (*t. australis*), however, is much like the 17-scale row form from which it possibly was derived (*bilineatus*), in respect to the stage of pattern evolution; in each the stripes are incomplete and disappear on at least the posterior fourth of the body. In the end forms of each of these two series (*i.e.*, in *lateralis*, *barbouri*, and *aurigulus* of the 17-scale row series, and in *taeniatus* of the 15-scale row series) the trend toward development of the stripes reaches its extreme, as shown by the full-length stripes. In one form (*t. ruthveni*) the pattern is very simple, and the stripes nearly absent; it is apparently a result of secondary reduction of the pattern.

In the cross-banded series, the trend is toward emphasis of the cross bands and retention of them for a longer period in the life of the individual. This trend reaches its maximum development in *piceus* and *flagellum*, and in a different form in each case. The more primitive of this series do not show any evidence whatever of the cross bands in the adults, but they do show a curious lined or spotted pattern on the individual scales. This tendency is shown somewhat in *mentovarius*, and in *striolatus* the spots at the bases of the scales are well developed. In both products of *striolatus* (*anthonyi* and *lineatulus*) the spots are replaced by a longitudinal dark line on each scale. In the next most primitive member (*flavigularis*) these lines are lost. It is of great significance that the most primitive member of the other two series of the genus (*bilineatus*) toward the southern part of its range has a longitudinal line on each scale, as in the primitive members of the cross-banded series; *bilineatus* also has such short stripes toward the southern part of its range that, save for the dark longitudinal line on the side of the head, it could easily be confused with *striolatus* of the cross-banded series.

Masticophis bilineatus Jan

Masticophis bilineatus Jan, Elenco Sist. Ofidi, p. 65. 1863 ("Messico occid?). —Jan and Sordelli, Icon. Gén., livr. 22, pl. 6, fig. 2 (Mexico). 1867.
Masticophis semilineatus Ortenburger, Mem. Univ. Michigan Mus. Zool. 1: 48–57, figs. 6–8, pls. 11–13. 1928.

Six specimens are from mainland Mexico: No. 15880, Guaymas, Sonora; no. 46382, Batopilas, Chihuahua; no. 46481, San Juan Capistrano, Zacatecas; no. 46417, Pedro Pablo, Nayarit; no. 32212, Guadalajara, Jalisco; no. 46499, Cuicatlán, Oaxaca. A specimen in the EHT-HMS collection is from a locality between Autlán and Guadalajara, Jalisco (no. 23516).

All have the stripes on the anterior part of the body, and the dark stripe through the upper part of the labials characteristic of the species. In the Guadalajara specimen the lateral light stripes are confined to the nape. The specimen from Cuicatlán has still shorter light stripes, and the body posterior to the nape is almost entirely unmarked; it seems very different from the typical, northern, half-lined specimens, yet the variation exhibited by the few specimens available is so great that I can not satisfactorily define any races within the species.

The young of this species are striped, as the adult. The chief distinguishing feature from *mentovarius*, from which it seems to have been derived, is the longitudinal black line on the sides of the head, involving the upper parts of the supralabials; the remainder of the supralabials are white. In *mentovarius* there is no such black line, and the labials are more or less uniformly mottled. In addition, the fourth and fifth labials normally are fused in the latter spe-

cies, so that only one large labial borders the orbit, but this character is not invariable (*cf.* Hartweg and Oliver, Misc. Publ. Mus. Zool. Univ. Michigan, no. 47: 19–20. 1940). The color character is invariable, however (it is believed), and is the chief reason for not considering these two forms as subspecies.

It is with little doubt that the name *bilineatus* of Jan is associated with this species. In the "Elenco" he states that the scale rows are 17, and that probably the snake came from western Mexico. In 1867 the type was well illustrated and shown to have a pattern precisely like that of the species generally known as *semilineatus*.

It is noteworthy that this is not *Masticophis bilineatus* Cope (Proc. Acad. Nat. Sci. Phila., 1866, p. 127), a name applied without description to two specimens (Field no. 777) in Schott's collection from Yucatán (U.S.N.M. no. 6555 now lost). Cope's synonymy for this name is *Herpetodryas bilineatus* Schlegel ined., Jan (Elenco Sist. Ofidi, p. 81. 1863). Cope probably used this name for the young of *Dryadophis boddaertii melanolomus*, and perhaps Jan had the same form. Regardless, however, of the identity of either Jan's or Cope's specimens, the name was suppressed by Cope in 1866, by his allocation of it to *Masticophis*, in which genus the same name was earlier proposed and diagnosed by Jan (1863).

Masticophis taeniatus australis, subsp. nov.

Holotype.—U.S.N.M. no. 10240, a juvenile female from "Guanajuato," collected by Alfredo Dugès.

Paratypes.—U.S.N.M. no. 111312, Tacícuaro, Michoacán; and EHT-HMS 26227, same locality.

Diagnosis.—Scales in 15-13 rows; a continuous, unbroken white line involving adjacent edges of third and fourth scale rows, extending three-fourths length of body; no or but faint evidence of a light stripe on adjacent edges of ventrals and first scale row; anterolateral edges of middorsal scales faintly lighter; ventrals 202 in female type.

Description of holotype.—Eight supralabials, fourth and fifth entering eye and largely fused together, last three-fifths length of seventh; fifth labial in contact with temporal; loreal single, a little longer than high; two preoculars, upper very large and separated from frontal, lower very minute and in contact with two (third, fourth) labials; two postoculars, upper larger; temporals in two rows of two or three scales; nine infralabials, four in contact with chin shields.

Dorsal scales in 15-15-13 rows, smooth, those on neck with single apical pits (others pitless); ventrals 202; caudals 143; anal divided; total length 517 mm, tail 159 mm.

Dorsal surface of head uniform brown, without light edges on scales; lips white, with a very fine black line on labial border of first five labials; a fine black line on orbital edges of scales entering orbit, least evident on supraocular; a very irregular, broken black border on upper edges of preocular labials; postoculars, most of upper preocular, and anterior edge of loreal white; in temporal region the dark color of the dorsal surface involves the extreme upper edges of the last three labials, and the posterior third of the eighth labial; an irregular, vague light spot in median posterior temporal region; a dark-edged white line beginning at nape and following the adjacent edges of the third and fourth scale rows to about the posterior fourth of the body, where it disappears; below this a brown band involving the second and adjacent half rows; belly mostly white, but with a slight pigmentation lat-

erally, making barely evident a faint light line involving adjacent edges of ventrals and first row of dorsals; this line disappears completely a little anterior to the point where the other line disappears. Posterior fourth of body and tail more or less uniform brown. Dorsal scales between stripes brown, their anterolateral edges lighter, their extreme anterior edges black. Tail white below, slightly stippled anteriorly.

Variation.—The two paratypes from Tacícuaro are also juveniles, as the holotype, and agree exactly with the latter in coloration. The ventrals of neither can be counted, but the caudals in one (male) are 147, in the other (female) 143. Supralabials 8-8 in each, infralabials 10-10, 11-11; oculars, temporals and scale rows as in type.

Remarks.—The closest relatives of *australis* appear to be *girardi* and *schotti*. Since the former is known from localities much nearer the range of *australis*, perhaps it is more closely related to the southern subspecies than is *schotti*, although *australis* certainly resembles the latter more closely. From *schotti*, *australis* differs by having no or very faint evidence of a light line on the adjacent edges of the ventrals and the first row of lateral scales; the belly in *schotti* is strongly pigmented laterally, except toward the posterior part of the body, while in *australis* the belly is almost uniform white, with very little stippling. From *girardi*, *australis* differs by lacking dark marks on the belly, by the presence of only a single lateral light stripe on the adjacent portions of scale rows three and four, by the absence of dark lines on the lateral scale rows, and (?) by the absence of light edges on the dorsal head scales. I have not seen young *girardi*, but according to Ortenburger "the pattern of the young of this species is somewhat different from that of the adult. The light cross-bands are absent except for a very narrow first dorsal band just behind the head. There is present a black median stripe through scale row 1; row 2 is brown with light lower edge; the lower half of row 3 is black, the upper half cream; row 4 is either all cream, or the lower half or two thirds cream, and upper third or half, black; row 5 is either dark like the remainder of the dorsal surface, or the lower fourth is cream and the upper three fourths dark. The light stripe on rows 3 and 4 is the only wide one present and, unless close examination is made, the general impression is that there is present but a single light lateral stripe. There is a dark brown spot on the anterior ends of those scales of row 4, which will, in the adult, be between the light interruptions. The regions which will be occupied by the light cross-bands and interruptions of the adult are already indicated by the lack of the anterior dark marks on the cream-colored scales of row 4. The belly is mottled only about half the way to the tail" (pp. 37–38).

Accordingly, while adults of *australis* are not yet known, the young available do not appear referable either to *girardi* (as it is known in the United States) or to any other previously described form. It should be remarked, however, that the young of the extreme southern "*girardi*" (*e.g.*, Zacatecas, southern Coahuila), the adults of which, like *australis*, lack the light edges on the dorsal head scales (present in northern, typical *girardi*), are not yet known; it is not impossible that they may prove to lack the juvenile characters of typical *girardi*, and be referable to *australis*.

Specimens of *australis* apparently were referred by Ortenburger to two other subspecies. The type was included with *t. taeniatus*, but from this it differs in so many pattern characters that they need not be enumerated here. On the basis of this specimen the range of *t. taeniatus* was conceived to include a portion of the central Mexican plateau. Present evidence does not verify its occurrence south of Lake Sante María, Chihuahua. The single rec-

ord (other than from Guanajuato) of *t. taeniatus* given by Ortenburger for areas south of central Chihuahua, is (apparently) San Pedro, Coahuila. If this record is correct, then it represents the extreme eastern edge of the range of the subspecies in this area, for a specimen of this group in the National Museum from a locality five kilometers southeast of San Pedro proves to be *girardi*. There is another specimen available of *girardi*, from central Zacatecas (La Colorada), which strongly indicates that, if *t. taeniatus* occurs south of Chihuahua, it must be confined to the extreme western edge of the plateau (from which area no specimens of the group are yet available); such a distribution does not seem very probable.

The remaining specimens, apparently of *australis*, available to Ortenburger, were referred by him to *ruthveni*. They are from San Luis Potosí (M.C.Z. nos. 19027–32) and are described as being striped, while the true juveniles of *ruthveni* are not (see discussion of latter).

The subspecies *australis* is perhaps the most primitive of *taeniatus*. Although *ruthveni* may appear to have the most primitive pattern, since in it the stripes are the least well defined of all, it seems only to represent a secondary obsolescence of pattern, perhaps from a type shown by the juveniles of *australis*. Intensification of the pattern of *australis* characterizes *schotti*, certainly a derivative of the former. These three form a unit opposed to the other (*taeniatus* and *girardi*); it is characterized by (1) the presence of light anterolateral edges on the middorsal scales, by (2) the narrowness of the light stripes, and by (3) the absence of light edges on the dorsal head scales.[2]

The subspecies *girardi* apparently also was derived from *australis* but at an earlier date than the others, since it typically lacks the light anterolateral edges on the dorsal scales and has broader light lines. Its close association with the *schotti* unit, however, is indicated by the absence of light edges on the dorsal head scales in southern specimens, and by apparent intergradation with *schotti*, and probably with *australis*. *M. t. girardi* has short, light stripes, as does *schotti* and *australis*, and in this respect differs from *taeniatus*, in which the light stripes (at least the primary) extend the full length of the body.

Masticophis taeniatus ruthveni Ortenburger

Five specimens of this form have been examined: TAMAULIPAS: 22 km. north of Victoria (no. 11443); Soto La Marina (no. 37546); 50 miles south of Brownsville, Texas (no. 64681). SAN LUIS POTOSÍ: 35 km. northwest of Ciudad Maiz (EHT-HMS 23517). MICHOACÁN: Zamora (EHT-HMS 21452).

Ortenburger (p. 46) states: "In one specimen, not fully grown (M.C.Z., no. 13951), a light lateral stripe ['covering adjacent parts of rows 3 and 4, bordered by black' (p. 21)] is present and continues the length of the body. Another specimen (U.S.N.M., no. 1974), very young, shows this light lateral stripe also, and except for the fact that the typical yellow marks on the dorsal scales are lacking it is quite similar to *schotti*. Six other young specimens were received from San Luis Potosí (M.C.Z. 19027–19032). These likewise show the lateral light stripe and lack of the light marks on the dorsal scales."

U.S.N.M. no. 1974 was from Matamoras, Tamaulipas, and is labeled in the catalog "*schotti*," but is now lost. In view of Gloyd and Conant's work (Occ. Pap. Mus. Zool. Univ. Mich., no. 287: 1–17, pls. 1–3. 1934) on this form and *schotti*, there can be but little doubt that this specimen was either a young *schotti* or else a *schotti-ruthveni* intergrade. Probably M.C.Z. no.

[2] The first and third characters need verification in adult *australis;* that they exist in present specimens of that form may be simply a juvenile characteristic.

13951 is the same, while M.C.Z. nos. 19027–32 almost certainly belong to *australis*. That none of these have the light marks on the anterolateral borders of the dorsal scales is rather obviously a juvenile character.

That the young of true *ruthveni* are not striped is shown by EHT-HMS no. 23517, from Ciudad Maiz. This specimen measures 495 mm in total length, the tail 160 mm. In color and pattern it is precisely like typical adult *ruthveni*, save that the dorsal scales are but very faintly light-edged anteriorly. No distinct stripes whatever are evident anteriorly; a faint, threadlike light line is visible on the neck at the lower edge of the fourth scale row, but in no sense is this similar to the lateral light line of *schotti* or *australis;* adult *ruthveni* also show an exactly similar line (see Ortenburger, pl. 9).

The most extraordinary specimen in the entire series is an apparently perfectly typical adult *ruthveni* from Zamora, Michoacán, a locality so far removed from others from which the subspecies is known that it is impossible to guess the significance of this record. Unfortunately the snake is badly crushed, having been found on a road. Its scale rows, supralabials, and oculars are typical; the dorsal surface is nearly uniform blue-green, except for yellowish borders on the extreme anterolateral edges of the median rows of dorsals; no stripes are present, except a very faint one anteriorly along the adjacent edges of the ventrals and first scale row.

This specimen may be just what it appears to be—a typical *ruthveni;* but if so a broad overlapping of the ranges of *australis* and *ruthveni* is indicated. Regardless of the manner of interpretation of this specimen and its significance, a considerable juggling is necessary in order to reconcile all known facts; so much hinges upon this specimen alone that speculation upon it should await verification of the record by further material.

Masticophis taeniatus girardi (Stejneger and Barbour)

Four specimens are known from Mexico, from "Chihuahua" (no. 14272); La Cuchilla, 5 miles south of San Pedro, Coahuila (no. 105300); 14 km. northeast of Pedriceña, Durango (EHT-HMS); and La Colorada, Zacatecas (EHT-HMS no. 5437, described by Dunkle and Smith, Occ. Pap. Mus. Zool. Univ. Mich., no. 363: 5–6. 1937). These lack the light borders on the dorsal head scales, typical of northern specimens.

Masticophis taeniatus taeniatus (Hallowell)

A single Mexican specimen examined is from Lake Santa María, Chihuahua (no. 46594).

Masticophis flagellum striolatus (Mertens)

Coluber striolatus Mertens, Zoologica **32**: 190. 1934 (*nom. nov.* for *Coluber lineatus* [Duméril and Bibron], preoccupied by *Coluber lineatus* Linnaeus).

Masticophis lineatus Ortenburger, Mem. Mus. Univ. Michigan **1**: 134–138, fig. 27, pl. 25. 1928.

Twenty-three specimens are in the collection: Nos. 24680–2, María Magdalena, Tres Marias Islands; no. 46483, Acaponeta, Nayarit; no 46386, Atemajac, Jalisco; no. 111278, Coyuca, Guerrero; no. 111277, 10 km. south of Cuernavaca, Morelos; nos. 32178, 32221–2, 32232–3, 62027–9, 62031–4, Colima, Colima; no. 32344, Zacatula River, near Lauria, Guerrero; no. 62026, Sierra Madre, Chacan River, Michoacán; no. 62030, Hurcha Volcano, plains of Nuruapa, Michoacán.

The original description (of *lineatus* Duméril and Bibron) appears to be a composite, based partly upon *striolatus* as at present defined and partly upon *lineatulus*. Fortunately a specimen from Colima is mentioned, which, for geographic reasons, probably is *striolatus* as at present understood.

Small specimens show traces of cross bands anteriorly, but in this form the banded pattern is less distinct than in any other of the species. This form is so obviously a close relative of *lineatulus*, which occurs in adjacent territory, that I believe there is little doubt they are subspecies. It moreover appears that *striolatus*, not *flavigularis*, as suggested by Ortenburger, is the most primitive form of the species *flagellum*.

Masticophis flagellum lineatulus, subsp. nov.

Holotype.—U. S. N. M. no. 105292, female, from a locality eleven miles south of San Buenaventura, Chihuahua.

Paratypes.—Thirteen in the U. S. National Museum: No. 12676, Guanajuato; nos. 14279, 14283, Chihuahua; no. 26151, "Mexico"; no. 46355, Guanacevi, Durango; no. 1988, Alamo de Parras, Cohuila; nos. 104675–6, Río Santa María, near Progreso, Chihuahua; no. 1989, Cobre Mines, New Mexico; no. 4388, Laguna, N. Mex.; no. 8429, "New Mexico"; no. 22142, Las Cruces, N. Mex.; no. 102240, Jornada Experimental Range, Doña Ana County, N. Mex. One in the Museum of Comparative Zoology, no. 14280, from Las Cruces, N. Mex. One in the EHT-HMS collection, no. 5388, between Torreón and San Pedro, Coahuila.

Diagnosis.—Scales in 17 rows, posteriorly 12 or 13; ventrals 190 to 198, caudals 99 to 110; posterior portion of belly and subcaudal surface red or marked with red (except in juveniles), even in long-preserved specimens (red not fading greatly); each dorsal scale with a longitudinal dark line or a posterior dark spot; head scales not light edged in young, no light loreal stripe (center may be light); young with cross bands 2 or 3 scales long, extending laterally to ends of ventrals, disappearing on middle of body.

Description of holotype.—Rostral rather prominent, strongly pointed posteriorly, as high as wide, portion visible from above as long as internasals; latter three-fourths length of internasals; frontal twice as broad anteriorly as between middle of orbits and posteriorly, about as long as its distance from tip of snout, very slightly shorter than frontal; nasal completely divided, anterior section a little larger and higher than posterior; loreal a little longer than high, in contact with two labials and lower preocular; two preoculars, upper in contact with frontal, lower much smaller and wedged between third and fourth supralabials; two postoculars, upper a little the larger; two irregular rows of temporals; an anterior temporal wedged between fifth and seventh labials, above sixth (which is small); eight supralabials, fourth and fifth entering orbit, fifth in contact with a temporal, seventh and eighth larger than others; infralabials 10-11, four in contact with anterior chin shields, two with posterior, fifth much the largest; anterior chin shields shorter, and a little broader, than posterior.

Dorsal scales smooth, with double apical pits, in 17-17-12 rows; ventrals 197; anal divided; tail incomplete. Total length 1,481 mm, tail 336 mm (plus a few mm).

Color.—Head light yellowish brown, darker toward posterior sutures; sides of head light yellowish brown, with a lighter area in the preocular, loreal, nasal and rostral; a dark, rounded spot in center of nasal; supralabials white (cream) below a line about even with posterolateral border of seventh labial and middle of subocular labials.

Dorsal ground color light yellowish brown, becoming more reddish toward middle of body, posteriorly mostly salmon red; all anterior dorsal scales with a central, longitudinal black streak, which becomes more spot-like on scales in middle of body, barely indicated on posterior scales; as the black spots become less distinct, the red areas become more distinct, the posterior scales being mostly red (with a little black near tip), with a white (cream) base; dorsal surface of the tail is even more strongly marked with salmon red.

Posterior edge of mental and broad areas near the sutures between the infralabials and chin shields, black-marked; a double row of black spots beginning with anterior ventral scales; posteriorly these spots becoming mixed with red and soon mostly red and very little black; anterior ground color of belly yellow, this color extending onto lower dorsal scale rows; toward middle of belly the color is largely replaced by salmon red, and posteriorly the belly is entirely red, with the double row of black spots faintly indicated; ventral surface of tail mostly red, the bases of the scales lighter (cream).

Variation.—The variation in scutellation is given in Table 1. In coloration the adult and subadult paratypes agree with the holotype, except that those long preserved have lost much of the original color. Without a single exception, however, every adult shows the typical salmon red color at least on the subcaudal surface.

Two very young specimens are from "Guanajuato" and "Mexico," both collected by Dugès and therefore probably from the vicinity of the city of Guanajuato. In these the dorsal head scales are not light-margined; sides of head with numerous vertical light marks, one on frontal; a light spot in loreal (not a stripe) and another on posterior section of nasal. Anterior part of body darker than posterior, and with narrow light cross bands covering considerably less than one scale length, placed at intervals of two or three scale lengths; these light cross bands extend to ventrals, somewhat irregular middorsally; tail, and middle and posterior part of body unmarked, becoming lighter posteriorly.

TABLE 1.—SCALE COUNTS IN MASTICOPHIS FLAGELLUM LINEATULUS

Number	Sex	Scale rows	Ventrals	Caudals	Supral.	Infral.	Proc.	Ptoc.	Temp.
1989	♀?	17–12	198	100	8–8	10–10	2–2	2–2	2–2
8429	♀	17–13	198	107	8–8	9–10	2–2	2–2	2–2
12676	♀	17–13	194	110	8–8	11–12	2–2	2–2	2–2
14279	♀	17–12	190	—	8–8	12–13	2–2	2–2	2–2
14283	♀	17–12	194	100	8–8	11–11	2–2	2–2	2–2
26151	♀	17–13	191	109	8–8	10–11	2–2	2–2	2–2
105292	♀	17–12	197	—	8–8	10–11	2–2	2–2	2–2
1988	♂	17–12	—	—	—	—	—	—	—
4388	♂	17–12	189	106	8–8	10–11	2–2	2–2	2–2
22142	♂	17–12	199	—	8–8	10–12	2–2	2–2	2–2
46355	♂	17–12	196	99	8–8	10–11	2–2	2–2	2–2
102240	♂	17–13	200	—	8–8	9–10	2–2	2–2	2–2
104676	♂	17–12	198	105	8–8	11–11	2–2	2–2	2–2
104675	♂	17–12	198	107	8–8	11–11	2–2	2–2	2–2

A young specimen, from "New Mexico," appears to be an intergrade between *lineatulus* and *flavigularis*, as it has the striped pattern anteriorly of the former, in addition to two narrow, widely separated dark cross bands typical of juvenile *flavigularis*. Another specimen, also young, from Doña Ana County, N. Mex., appears to be an intergrade, as it has dim evidence anteriorly of cross bands somewhat like those of juvenile *flavigularis;* the

specimen is so nearly grown, however, that the nature of the cross bands is not readily discerned; the striped pattern anteriorly is distinct and typical of *lineatulus*. A specimen in the University of Michigan Museum of Zoology, from 8 miles north of Hereford, Ariz. (no. 69668) closely approaches *lineatulus*, differing only by having a light loreal stripe as in *piceus* (see color description by Gloyd, Bull. Chicago Acad. Sci. **5**: 117–118. 1937).

Remarks.—The adults of this subspecies are readily distinguishable from *flavigularis* and *piceus* by the striped scales; they also lack the loreal stripe

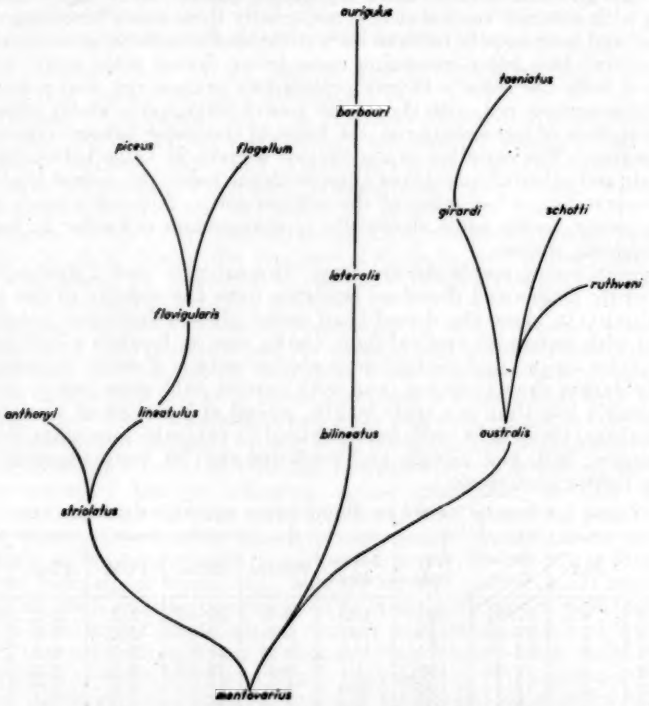

Fig. 1.—Possible phylogeny of the members of *Masticophis*.

of the latter. Preserved *lineatulus* also retain the red ventral color, while *flavigularis* and *piceus*, although frequently brilliant red in life, lose this color very quickly in preservative.

The young of *lineatulus* are strikingly different from those of *flavigularis*, with narrow, dark cross bands; *piceus*, with a light loreal stripe and the two or three anterior dark bands broad and very dark (black), those following conspicuously lighter; and *striolatus*, with light margins on the dorsal head scales.

Ortenburger anticipated the separation of this subspecies in his discussion of *flavigularis*, with which specimens of *lineatulus* were associated. "One specimen (M.C.Z., no. 14280) is particularly interesting in that it approaches

piceus in ventral coloration and number of ventrals. The belly is red like that of the typical *piceus* of the west [but which does not retain this red in preservative], and moreover it has 202 ventrals, a much higher number than would be expected for *flavigularis*. It is from the western part of the range of the form—Las Cruces, Doña Ana County, New Mexico. Four other specimens show a similar coloration. Two of these are from Chihuahua and another from Durango, and another from San Luis Potosi. A singular dorsal coloration is exhibited by all these specimens. Practically all the dorsal scales have an elongate median dark mark. Whether these very few interesting specimens will eventually be considered as belonging to a distinct form cannot now be determined" (pp. 102–103).

Masticophis flagellum flavigularis (Hallowell)

Six specimens: NUEVO LEÓN: 15 miles north of Monterrey (no. 111268); Pesquieria Grande (no. 1995); Santa Caterina (no. 1992); TAMAULIPAS: Mier (no. 48091). SAN LUIS POTOSÍ: Chijol (no. 46476). SONORA: San Bernardino Ranch (no. 21052). All are typical adults, of nearly uniform light brownish-gray color.

Juveniles have very narrow, dark cross bands, and in this respect they differ from the young of all other subspecies.

The record from extreme northwestern Sonora is substantiated by another specimen of *flavigularis* from Apache, Ariz. (no. 8428, juvenile). These two specimens lack the loreal stripe and dark anterior cross bands of *piceus* and also the red ventral color and striped scales of *lineatulus*. The subspecies *flavigularis* apparently surrounds the latter north of the United States-Mexico boundary.

Masticophis flagellum piceus (Cope)

The only specimen from mainland Mexico is one from Altata, Sinaloa (no. 33570).

Juveniles of this subspecies have a distinct white loreal stripe, as has previously been pointed out; the cross bands on the body extend to the ventral surface; the posterior part of the body is considerably lighter (uniform) than the anterior (banded); and the extreme anterior nuchal bands are darker than the succeeding bands. In Arizona and Sinaloa specimens the dorsal head scales usually are light-edged, and the anterior cross bands are less distinctly differentiated from the succeeding bands; California specimens usually do not have the dorsal head scales light-edged, and the anterior cross bands are very well differentiated from (darker than) the succeeding bands.

It is obvious that the black phase for which the name *piceus* has generally been used can not have arisen by the same procedure as have all other members of *Masticophis* recognized at present. It is, almost beyond question, a mutant form, occurring within the range of *"frenatus"*; it does not seem of greater significance than the red phase of the same species. Taylor (Kansas Univ. Sci. Bull. **24**: 491. 1936 [1938]) describes a specimen in which only "the anterior half of the body is black. About the middle of body there are three, black-spotted, reddish bands, while the latter third of the body is more or less reddish. The specimen was captured in the heat of the day under a flat rock, near La Posa [Sonora]." It is unfortunate that the name of an atypical phase must, because of priority, be used for the species; such is the case, however, in this form, for *piceus* (1892) antedates the only other name (*frenatus*, 1893) that has been applied to this race. The latter name, more-

over, is not available under any circumstance, since it is a suppressed homonym of *Herpetodryas frenatus* Gray (Ann. Mag. Nat. Hist. (2) 12: 390. 1853.) from India, placed in the genus *Coluber* (*Coluber frenatus*, a valid species) by Boulenger (Fauna Brit. India, Rept., p. 335. 1890). If the California specimens are ultimately distinguished from Arizona ones, or if the name *piceus* is restricted to the black phase, a new name or names will be required.

KEY TO MAINLAND MEXICAN MASTICOPHIS

1. Scales in 15 rows 2
   Scales in 17 rows 6
2. A distinct lateral light stripe involving edges of third and all or adjacent edge of fourth row 4
   No distinct lateral light stripe involving third and fourth rows ..... *taeniatus ruthveni*
3. Upper lateral light stripe involving fifth row of scales 4
   Upper lateral light stripe confined to adjacent edges of third and fourth rows, always continuous 5
4. Lateral light stripe broken or partially interrupted anteriorly, not reaching anal region ..... *taeniatus girardi*
   Lateral stripe continuous and uniform in character throughout its length, reaching anal region ..... *taeniatus taeniatus*
5. A very distinct, light lateral stripe on adjacent edges of ventrals and first row of dorsals; young and adults ..... *taeniatus schotti*[3]
   No or only faint evidence of a lateral light stripe on adjacent edges of ventrals and first row of dorsals; young only (adult not known) ..... *taeniatus australis*
6. A single labial entering orbit ..... *mentovarius*
   Two labials entering orbit 7
7. No longitudinal light stripes exclusively on lateral rows anteriorly; if present, equally distinct on dorsal as on lateral rows 9
   Lateral light stripes present anteriorly, these more distinct than dorsal light stripes (if any) 8
8. Lips mottled ..... *mentovarius*
   Lips mostly white, bordered above by black ..... *bilineatus*
9. In young, neck bands much darker than succeeding bands, considerably broader than spaces between them; in adults, neck bands always visible; a longitudinal white stripe through loreal ..... *flagellum piceus*
   In young, neck bands not greatly darker than those following; in adults, if bands are visible, they are narrower than the spaces between them; no distinct white stripe through loreal 10
10. Caudals 109 or more; a dark spot at the base of each scale; usually no dark lines through the centers of anterior scales ..... *flagellum striolatus*
    Caudals usually less; no dark spots at the bases of the scales, or if so a dark line through the center of the anterior scales 11
11. In adults, a dark line through the center of each scale at least on anterior part of body, and at least subcaudal surface salmon red *in preserved specimens;* in young, the dark bands broader than the light interspaces, which are incomplete and irregular ..... *flagellum lineatulus*
    No dark lines through centers of scales; ventral surfaces not red except in live or very recently preserved specimens; young with narrow dark crossbands, narrower than light interspaces, which are complete ..... *flagellum flavigularis*

[3] Not yet recorded from Mexico, but almost certainly occurring.

ZOOLOGY.—*Notes on* Squilla empusa *Say.*[1] ROBERT PAYNE BIGELOW, Massachusetts Institute of Technology. (Communicated by WALDO L. SCHMITT.)

The purpose of this paper is to place on record some observations made under especially favorable circumstances upon the coloration of *Squilla empusa* Say (1818), including a few notes on the behavior, external anatomy, and sexual dimorphism of this stomatopod crustacean, the only one found normally in the vicinity of Woods Hole, Mass.

Squilla empusa is known to range southward to the Gulf of Mexico and Texas. It has been found also in the West Indies and has been reported from west Africa. Buzzards Bay appears to be the northern limit of its distribution, and, while the pelagic larvae are occasionally abundant in the plankton, adults are rarely taken (Sumner et al., 1911). Only a few specimens are brought into Woods Hole from time to time by scallop, *Pecten* (*Plagioctenium*) *irradians* Lamarck, or quahaug, *Venus mercenaria* Linnaeus, fishermen. In September 1931, however, a number of half-grown specimens were taken with the seine in the Wareham River; and on several trips made between the first of August and the last of September 1932, large numbers of adults were captured by Robert A. Goffin, of the U. S. Fisheries Biological Station, with a shrimp-trawl in Mattapoisett Harbor and in Wareham River, on the north shore of Buzzards Bay.

Although in Woods Hole at the time, I was unaware of these events until—just as I was about to leave—my attention was called to an exhibit in the public aquarium room of the Fisheries Station. In a big glass aquarium, close by a large window of frosted glass, were 21 adults selected from some hundred specimens taken by Mr. Goffin with the otter shrimp-trawl at a depth of about 3 fathoms in Mattapoisett Harbor on September 6, 1932. The specimens were lively and in excellent condition, visible from all sides, and brilliantly illuminated by diffused sunlight during the morning hours. Their coloration was striking. This is a feature usually neglected in taxonomic works (cf. DeKay, 1844; Bigelow, 1895; Pratt, 1916), and here was an opportunity not to be missed. As the time at my disposal was short, I made careful notes without waiting to consult the literature. Thus my observations were made independently of the detailed but rather incomplete descriptions of Say (1818, p. 252) and of Verrill and Smith (1873, p. 369), and for that reason, perhaps, they may be worthy of record.

[1] Received April 14, 1941.

COLOR PATTERN

As seen in the aquarium, the animals were ornamented on the dorsal side by a ground color and by markings in various other colors that produced a brilliant pattern. The ground color was an opalescent purple—described by another observer as "mauve," or gray with a tinge of violet. Across the median area of the somites of the hindbody were transverse shadowy gray patches, most marked on the second abdominal somite.

Aside from these indistinct patches, the markings were mostly green, opaque white, yellow, and orange. The green color marked the projecting portions of the integument. On the posterior border of the carapace and of each somite of the hindbody there was a band of apple green shading anteriorly into a deep olive-green. The bright-yellow edge mentioned by Say and by Verrill accentuates the light green on the margins of the carapace and the last two abdominal somites. Except for the marginal carinae of the abdomen, each carina, from the rostrum to the telson, and the basal bosses of the marginal teeth and denticles of the telson were marked by green in the same way. On the dorsal surface of the telson each one of the pits on each side of the crest appeared as a light-green spot. Also the dorsal carina on the propodus of the raptorial limb is light green, while the margin of the ventral groove of the merus is purple, the two colors coming close together when the claw is closed.

The opaque white markings on the body consist of fine lines and spots in a symmetrical pattern on the submedian area of the thoracic and abdominal somites, and of large irregular patches lateral to the intermediate carinae of the thorax and of the abdomen and between the lateral and marginal carinae of the abdomen, extending to the flattened surface of the marginal carinae. The mobile spines of the uropods are entirely white, and the same color appears on the tips of the submedian and intermediate teeth of the telson and of the prongs of the basal process of the uropods, and along the outer margins of the pleopods. The thoracic limbs are pinkish white.

The antennal scales are yellow toward the apex, while a deeper yellow marks the outer half of the paddle of the uropods. The color scheme is completed, in the main, by broad fringes of setae that border the antennal scales, the pleopods, and the uropods. These are a shade of orange that forms a strong contrast to the other colors.

The eyes are among the most striking features of these animals. Both Say and Verrill describe them as brilliant emerald-green. In our specimens the outer layers of the cornea were perfectly transparent,

and within could be seen a dark mass with a brilliantly iridescent metallic luster. The eye stalks were translucent with a pinkish or orange hue.

If this more detailed description is compared with that of Say or of Verrill and Smith, it will be found to differ in many particulars. It differs fundamentally from the description and figure of DeKay (1844, p. 33, fig. 54).

It is well known that some Crustacea change color with a change of background (Keeble and Gamble, 1904; D. C. Smith, 1930; F. A. Brown, 1935). Late in the summer of 1933 it was suggested to me that *Squilla empusa* may be one of the variable species. To test this an attempt was made to obtain material for experiments, but a day of strenuous dredging, September 14, yielded only one specimen where the species had been abundant the year before. Without an ample supply one could not expect significant results. Nevertheless, this one large female was subjected to a series of experiments with apparatus kindly lent by G. H. Parker at the Marine Biological Laboratory, and no change in color was observed. That result is perhaps to be expected of an animal that spends part of its life in a burrow. If there is any change, it may be very slow, as in the crayfishes (Kent, 1901).

BEHAVIOR

While notes were being made of the color the animals were constantly in motion. Even those that were resting on the bottom exhibited rhythmic, fanlike movements of the epipodites on the first five pairs of thoracic limbs. These movements of the epipodites were not in phase with the similar rhythmic motion of the gill-bearing abdominal appendages, the pleopods. It was amusing to observe the use that frequently was made of the first thoracic limb to clean the body. By means of the brush of setae on the terminal segment, first the adjacent limbs were thoroughly scrubbed, then the body was bent so that other parts could be reached, until finally a complete toilet had been accomplished, including all the abdominal appendages and gills.

Locomotion on the bottom was by alternate movements of the three pairs of thoracic walking legs; but change from place to place was chiefly by swimming with progressive oarlike strokes of the pleopods. Occasionally a sudden backward movement was made by a powerful flexure of the hindbody. Application of the net handle to the antennules of a resting individual evoked a stroke of the raptorial claws that was startling in its swiftness and force.

There were small fishes in the aquarium. They were frequently pursued. The capture was observed of a menhaden about 5 cm in length. This was accomplished by bilateral grasping movements of the raptorial limbs. The fish was quickly bitten cleanly in two. The posterior half dropped to the bottom. There it was found and eaten by another squilla while the captor was consuming the other part.

STRUCTURAL FEATURES

Opportunity to supplement previous descriptions of the structural features of this species is afforded by the courtesy of Mr. Goffin, who placed in my hands two males (76 and 145 mm) and three females (97, 105, and 180 mm) preserved from the catch of September 6, 1932; and also a male (150 mm) taken with a scallop-dredge in Buzzards Bay at North Falmouth in November 1926.

The facts to be recorded are in two groups—first, referring to the affinity of this species to other species of the genus; and, second, relating to sexuality.

In the first group should be noted the presence of mandibular palps with three segments; epipodites at the bases of all of the first five thoracic limbs; and an abdominal spine-formula (Kemp, 1913, p. 9), as follows:

Carinae ending in spines	*Abdominal somites*					
Submedian					5	6
Intermediate			(3)	4	5	6
Lateral	(1)	2	3	4	5	6
Marginal	1	2	3	4	5	

The carpus of the raptorial limb, when fully developed, bears a dorsal crest with four sharp teeth, the distal one out of line with the others. The exopodite of the uropods is armed with 8 or 9 (rarely 6) mobile spines, the distal one acute, not greatly elongated, and curved toward the apex of the limb.

SEXUAL DIMORPHISM

Of special interest are the differences in the sculpturing of the telson and the abdominal somites to be seen by comparing young with old of both sexes and fully grown males with females of the same age. These differences were well marked in the six specimens examined at Woods Hole. In the two smaller females and the small male the crest and marginal carinae of the telson have sharply defined summits; and the marginal carinae of the abdomen, separated by a distinct groove from the edge of the somite, are but slightly wider than the other carinae and each one is distinctly grooved longitudinally. In the large

female (180 mm) and the two large males (150 and 145 mm in median length) the sculpturing of the telson is alike and differs from that of the smaller specimens in having the crest and marginal carinae swollen and broadly rounded at the summit.

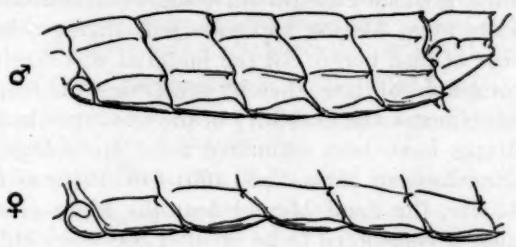

Fig. 1.—*Squilla empusa*: Six abdominal somites of a male 150 mm long and lateral and marginal carinae on the abdomen of a female 180 mm long. Left lateral aspect, natural size.

On the other hand, the marginal carinae of the abdomen in these large individuals exhibit distinct sexual differences, as shown in Fig. 1. On the third abdominal somite of the large female these carinae are grooved on the anterior third of their length and the posterior two-thirds is broad (about one-tenth the length) and distinctly swollen. This feature is progressively less marked on the other somites toward each extremity of the abdomen. The two large males differ from the female in having these carinae very much broader (maximum width about one-fourth the length) with the summit a broad flat plane—not at all grooved, except slightly on the first abdominal somite.

Thus our species shows distinctly in one feature, previously overlooked, some of the sexual dimorphism, that is conspicuous in several closely related species of the Panama region.

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ORNITHOLOGY.—*Bird bones from Eskimo ruins at Cape Prince of Wales, Alaska.*[1] HERBERT FRIEDMANN, U. S. National Museum.

In the summer of 1936, H. B. Collins, Jr., of the Bureau of American Ethnology, excavated a number of old Eskimo habitations in the Cape Prince of Wales area, Alaska, and collected, among other material, a large number of bird bones. All the material was carefully labeled with full stratigraphical data, thereby preserving the relative ages of the various specimens. The antiquity of the sites and the levels of the different cuttings have been estimated from archeological evidence by Collins (Smithsonian Misc. Coll. **100**: 545. 1940) as follows:

The oldest site, the Sand Mound near the Light House, 2 miles north of Wales, is considered to be about 1,500 years old; a series of numbered cuts (1–10) are next in age—1,000 years, as are also the basal layers of two cuts "above A and B"; two sites named Mugisaktavik and Eyumnik are next in age, with an estimated 100–150 years; finally come a series of excavations "A, B, C, and D," assumed to be 50–100 years old.

The bulk of the material coming from the older diggings (1,000–1,500 years old) are of the Punuk-Thule archeological level and are, therefore, comparable to the diggings from Ievoghiyoghameet and the upper part of Myiowaghameet at Gambell, St. Lawrence Island (reported in Journ. Washington Acad. Sci. **24**: 83–96. 1934). A comparison of the present lot of bones with the Gambell series reveals some striking differences, but differences that seem to reflect dissimilarities in the bird life of the two areas, rather than in any differential human selectivity.

In the material collected on St. Lawrence Island, bones of the murres (*Uria*) were by far the most abundant elements of the bird remains, totaling about 60 percent of all the bones collected; in the Cape Prince of Wales collection only a moderate number of murre bones were found, and they were far exceeded numerically by remains of the king eider. In the former area there are cliffs that harbor breeding colonies of murres; in the latter area there are none, and it seems that this is the reason for the dissimilarity in the collections, rather than any great proclivity for murres of the St. Lawrence Eskimos, as contrasted with the Wales Eskimos. Other minor differences are noted under the separate species accounts.

The chronology of the cuttings involves only a span of not more

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than 1,500 years, and, as might be expected, it reveals no changes in the bird life of the area.

Gavia immer (Brünnich): Common Loon

The common loon is represented by bones from five cuttings, ranging from the most recent (50–100 years old) to the oldest (over 1,000 years) strata. In the oldest one, eight bones representing at least three individuals were found; in the others, only single bones were collected.

Gavia adamsi (Gray): Yellow-billed Loon

Five cuttings considered to be of the Punuk-Thule period (1,000 years old) each yielded a single bone of this species.

Gavia arctica pacifica (Lawrence): Pacific Loon

The Pacific loon is represented by bones from nine cuts, all of the Punuk-Thule period, and also from the oldest site—a few centuries older. The largest number of bones in any one cut was three, so this species cannot be looked upon as a very frequently eaten article of diet. The actual specimens identified are five carpometacarpals, five tarsometatarsals, four humeri, two tibiotarsi, and a pair of mandibles.

Gavia stellata (Pontoppidan): Red-throated Loon

Bones of this bird were collected in five cuttings, all of about 1,000 years antiquity. The bones included four tibiotarsi, one radius, one ulna, one pair of mandibles, and two coracoids.

Puffinus tenuirostris (Temminck): Slender-billed Shearwater

The old cuttings (1,000 years) yielded a single humerus each of this shearwater. It would seem from this that the slender-billed shearwater was rarely eaten by the Eskimos of the area.

Phalacrocorax pelagicus pelagicus Pallas: Pelagic Cormorant

Sites of all ages from 50 to 1,500 years yielded bones of this cormorant. In the oldest cut, that of the Sand Mound near the light house, were found the greatest number—three femurs, two coracoids, three ulnae, three tibiotarsi, and seven humeri; in the others the number was smaller—from one to three bones.

In a report on a similar collection of bird bones from Eskimo ruins on St. Lawrence Island (Journ. Washington Acad. Sci. **24**: 88. 1934) it was noted that "although many limb bones were found, only four synsacra and one sternum were unearthed and no parts of the skull or mandibles." In the present collection, there is a similar absence of skull bones and sterna, and only one synsacrum was recovered. Inasmuch as sterna, synsacra, and skulls of other birds of similar size, especially the eider ducks, are present in numbers, together with their corresponding limb bones, it is difficult to explain their absence in the case of the cormorant.

Branta canadensis (Linnaeus): Canada Goose

Bones of this species, but not certainly identifiable to subspecies, were found sparingly. Five sites yielded one bone each. The Eyumnik cut revealed a femur and in four of the excavations of Punuk-Thule area, there were unearthed two ulnae, one humerus, and one carpometacarpal.

Branta nigricans (Lawrence): Black Brant

The black brant is represented in the material collected from five old (Punuk-Thule period) diggings, and from one recent (50–100 years old) one. The old sites yielded a single bone each; the recent one, two humeri.

Philacte canagica (Sevastianoff): Emperor Goose

Remains of the emperor goose were found in eleven cuttings, ranging in age from the most ancient (Sand Mound—ca. 1,500 years) to those of the Punuk-Thule period (ca. 1,000 years). Strangely enough, no bones were found in the excavations of more recent sites. This is essentially similar to the St. Lawrence Island record, where no bones were found in the oldest or the most recent cuts, but only in diggings at Kialegak and Seklowaghyaget, both of Pinuk-Thule age. In the St. Lawrence Island collection, there were no long bones, but chiefly metacarpals, clavicles, and coracoids; in the present series are humeri, ulnae, femurs, sacra, metatarsals, and metacarpals.

Anser albifrons (Scopoli): White-fronted Goose

The white-fronted goose is sparingly represented by bones found in six diggings of from 1,000 to 1,500 years antiquity. In all but one of these sites, only single bones were unearthed; in the one, there were two bones.

Anas platyrhynchos platyrhynchos Linnaeus: Common Mallard

Considering the total absence of bones of this species in the St. Lawrence Island material, it is surprising to find the mallard abundantly represented in the present collection. No fewer than 49 bones of this duck were unearthed in 24 diggings of all ages from most ancient to most recent.

Dafila acuta (Linnaeus): Pintail

Four cuttings of Punuk-Thule age yielded one bone each of this duck. It was even scarcer in the St. Lawrence Island collection, where only a single bone was unearthed in a cut of comparable age.

Nyroca marila (Linnaeus): Greater Scaup Duck

Fifteen diggings yielded 25 bones of this duck (tibiotarsi, humeri, and ulnae).

Glaucionetta clangula (Linnaeus): Goldeneye

A few bones of this species were found in two cuttings of about 1,000 years of age. The subspecific identification is impossible even to guess at, as either the Asiatic or the American form might occur in the region.

Clangula hyemalis (Linnaeus): Oldsquaw

The oldsquaw is represented by 26 bones from 15 different diggings, all but one recent one of Punuk-Thule age. This is in agreement with the record of the species in the collection from St. Lawrence Island.

Polysticta stelleri (Pallas): Steller's Eider

Unlike the St. Lawrence Island material, where this duck was poorly represented, the present collection contains 30 bones from 20 sites. With two exceptions (both recent sites) all the diggings involved were of Punuk-Thule age. The number of bones varied from one to nine in any single site.

Somateria v-nigra Gray: Pacific Eider

The Pacific eider is very abundantly represented in the present collection, 107 bones from 35 diggings being identified as of this species. All ages, from 50 to 1,500 years, are presented in the cuttings involved.

Somateria spectabilis (Linnaeus): King Eider

The most abundant species in the collection, no less than 188 bones from 60 diggings being of this eider. These diggings cover the entire time range of from 50 to 1,500 years antiquity.

Melanitta deglandi (Bonaparte): White-winged Scoter

The white-winged scoter is represented by 18 bones from eight diggings, all of the Punuk-Thule period. The bones include humeri, tibiotarsi, and sterna.

Oidemia americana Swainson: American Scoter

Eight bones of this duck were unearthed in four cuttings, two of which were of recent date and two of Punuk-Thule age.

Lagopus sp.: Ptarmigan

Eight bones (seven humeri and one metacarpal) from as many cuttings, all but one (recent) of Punuk-Thule age, are here recorded together. Probably two species, the rock ptarmigan, *Lagopus rupestris* subsp., and the Alaska ptarmigan, *Lagopus lagopus alascensis* Swarth, are represented, but it is not possible to identify them with absolute certainty.

Grus canadensis canadensis (Linnaeus): Little Brown Crane

Four diggings of the Punuk-Thule level revealed bones (one in each) of the little brown crane. The bones were a skull, two fragmentary tibiotarsi, and a tarsometatarsus.

Stercorarius pomarinus (Temminck): Pomarine Jaeger

The absence of jaeger bones in this collection is noteworthy by contrast with their abundance in the St. Lawrence Island material. Whereas in the latter collection, there were large numbers of bones of the long-tailed jaeger and a few remains of the parasitic jaeger, the Cape Prince of Wales excavation yielded only three tibiotarsi of the pomarine jaeger, all from one cutting of Punuk-Thule age.

Larus hyperboreus Gunnerus: Glaucous Gull

Eleven cuts of all ages from 50 to 1,500 years yielded bones (one in each case) of this large gull. The bones included metacarpals, humeri, mandibles, tarsometatarsi, and tibiotarsi.

Larus glaucescens Naumann: Glaucous-winged Gull

Bones of this gull were found in only two of the cuttings of Punuk-Thule age. The excavation at Eyumnik yielded two metacarpals and a femur; the other (cut 8), one tibiotarsus.

Larus argentatus subsp.: Herring Gull

The most abundantly represented gull. Twenty-five bones from 16 diggings are identified as of this species; the diggings covering the entire time range of from 50 to 1,500 years.

Rissa tridactyla pollicaris Ridgway: Pacific Kittiwake

In three diggings, one recent and two of Punuk-Thule age, were found bones of the Pacific kittiwake (one bone—a humerus, in each case).

Xema sabini (Sabine): Sabine's Gull

Sabine's gull is poorly represented in the collection, only two tibiotarsi being identified. These came from two cuts of Punuk-Thule age.

Sterna paradisaea Brunnich: Arctic Tern

The Arctic tern is represented by a humerus and an ulna from a cutting of Punuk-Thule age. Judging by its absence in all the other cuttings, one may surmise that it was very infrequently eaten.

Uria spp.: Murres

Murres, probably of two species, *Uria lomvia arra* (Pallas) and *Uria aalge californica* (Bryant), are represented by 104 bones found in 38 cuttings of all ages from 50 to 1,500 years. The most striking contrast between the present collection and that from St. Lawrence Island is the relative abundance of murre bones. In the latter, murre bones comprised a little more individual bones than all the other species combined; in the present collection, no such outstanding preponderance is true, in fact, murre bones are greatly outnumbered by king eider and also by Pacific eider. Undoubtedly, the reason for this is that on St. Lawrence Island, there are many cliffs where the murres nest, while in the Cape Prince of Wales area there are no such formations and hence murres are not only less numerous but also harder to catch than where they can be snared at the nest.

The greatest number of murre bones from any one digging is from the oldest site—Sand Mound near the Light House, where eleven humeri, one femur, two coracoids, two metacarpals, eight ulnae, and three tibiotarsi were unearthed; the next most productive cut, one of Punuk-Thule age, yielded one skull, two sterna, two pairs of mandibles, two synsacra, two humeri, two ulnae, one coracoid, and three tibiotarsi. In the cuts of recent age, the number of murre bones (where found) is from three to six. It follows that the Eskimos of Cape Prince of Wales did not feed on murres to anything like the extent that the St. Lawrence Islanders did.

Cepphus columba Pallas: Pigeon Guillemot

The pigeon guillemot is represented by nine bones (all femurs!) from three cuttings of Punuk-Thule age.

Cyclorrhynchus psittacula (Pallas): Paroquet Auklet

Three diggings, two of Punuk-Thule age, and one recent one, revealed bones (one in each case) of the paroquet auklet. This is in striking contrast to the abundance of remains of this species in the St. Lawrence Island collection.

Aethia cristatella (Pallas): Crested Auklet

Of this auklet, 47 bones were gathered from 27 different cuttings. While most of the bones were humeri, there were also sterna, coracoids, and clavicles.

Aethia pusilla (Pallas): Least Auklet

Fourteen diggings, all but one of Punuk-Thule age, and one recent one,

contained bones of the least auklet, 29 in all, including humeri, sterna, coracoids, and metacarpals.

Fratercula corniculata (Naumann): Horned Puffin

A single humerus from a cutting of Punuk-Thule age is the only bone of the horned puffin found in the collection. The scarcity of remains of this species and the next one may not necessarily indicate the numerical status of the two species in the area, as on St. Lawrence Island, "in spite of their abundance and size, neither of the puffins . . . seems to have figured very largely in the diet of the ancient Eskimos" (Journ. Washington Acad. Sci. **24**: 96. 1934).

Lunda cirrhata (Pallas): Tufted Puffin

The tufted puffin is represented by five bones from two excavations of Punuk-Thule age.

Nyctea nyctea (Linnaeus): Snowy Owl

A single coracoid from a recent site (50–100 years old) is the only bone of this species in the collection. As on St. Lawrence Island, owls may not have been looked upon as food.

Corvus corax principalis Ridgway: Northern Raven

Two raven bones, one from the oldest site (1,500 years) and one of Punuk-Thule age (1,000 years) are all that represent this bird. However, this is due not to the scarcity of the raven but to the taboos regarding killing it. Not a single raven bone was found in the refuse mounds on St. Lawrence Island, where the raven is a common bird.

ICHTHYOLOGY.—*The gobies* Waitea *and* Mahidolia.[1]

HUGH M. SMITH, U. S. National Museum.

The two gobioid genera *Waitea* and *Mahidolia*, with a rather wide distribution in the Oriental and South Pacific regions (Philippine Islands, Samoan Islands, Java, and Thailand or Siam), have become somewhat involved in the literature, and it seems desirable, with the information and material now available, to attempt a clarification of their status. These genera are similar in possessing a pronounced backward extension of the jaws, but their general appearance is different and taxonomically they are quite distinct.

Genus **Waitea** Jordan and Seale

Jordan and Seale (1906) established *Waitea* as a new genus of gobies and indicated *Gobius mystacinus* Cuvier and Valenciennes (1837) as the genotype. No description of the genus was given except that it was close to *Gobionellus* but had the maxillaries produced backward as in *Opisthognathus*. Beyond the mere listing of *Waitea mystacina* (Cuvier and Valenciennes) as being known from Samoa and Java,

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there was no reference to any specimens taken in Samoan waters, although there was published a text figure from a drawing presumably made from a Samoan specimen. It is not a matter of record that the authors of *Waitea* compared their Samoan fish with any authentic specimen of *Gobius mystacinus*.

The first definition of the genus *Waitea* seems to have been given by Herre (1927) and was based on Jordan and Seale, reinforced by the information afforded by specimens from the Philippine Islands. Herre identified these fish as *Waitea mystacina;* and while his description was in some particulars considerably at variance with specimens from the Philippines and Samoa in the U. S. National Museum, Herre considered his specimens "unmistakably the same fish as shown in Jordan and Seale's figure."

The description and discussion of the genus *Waitea* given by Koumans (1931) were most unsatisfactory because his conclusions were based largely on the examination of two specimens in the Paris Museum collected in Java by Kuhl and van Hasselt and labeled *Gobius mystacinus* which were subsequently found by Koumans to represent *Oxyurichthys microlepis* (Bleeker). Koumans later examined the undoubted type of *Gobius mystacinus* in the Paris Museum but in trying (1935) to reconcile that type with *Waitea mystacina* of Jordan and Seale of which he had seen no specimens he ran into further difficulties and concluded his consideration of *Waitea* and *Waitea mystacina* in these words:

> The figure of *Waitea mystacina* (C. & V.) published by Jordan & Seale (Bull. Bur. Fish. xxv, 1905, p. 407, fig. 94) differs from the type specimen in Paris Museum in several respects. The anal fin shows I.11 rays instead of I.9 in the type specimen; in the figure the 5th ray of D.I. is the longest, in the type specimen the first ray is the longest, the other rays decrease gradually in length. The shape of the caudal is not lanceolate in the type specimen, but much shorter, and finally the pattern of coloration is a totally other one. So I am not quite certain that Jordan & Seale had the real *Gobius mystacinus* in hands and therefore the locality Samoa is uncertain.

The U. S. National Museum contains a specimen of *Waitea* collected at Apia, Samoan Islands, by Jordan and Kellogg in 1902, which is without doubt the same fish as figured by Jordan and Seale from a drawing by W. S. Atkinson.

From a critical examination of this specimen it is clear that the fish that Jordan and Seale identified as *Gobius mystacinus* of Cuvier and Valenciennes and made the type of their genus *Waitea* is not the fish that Cuvier and Valenciennes so designated. While there is a certain similarity, the differences are so marked and fundamental

that the two fishes can not be regarded as conspecific or even congeneric.

In this case, of which there are numerous parallels in the annals of zoological nomenclature, a new genus has been assigned a genotype that is assumed to be identical with and is given the name of an existing species that, in fact, is not the same as the particular fish in hand.

The question arises (*a*) whether the old specific name *mystacinus* together with the species it had hitherto represented goes with the new genus for which it had been mistakenly designated as the type, or (*b*) whether the fish incorrectly identified as *Gobius mystacinus* should receive a new specific name. The latter course seems preferable and will here be followed, although the International Rules of Zoological Nomenclature do not appear to provide the means for a definite decision. The Opinion of the International Commission on Zoological Nomenclature that bears most directly is No. 65, dealing with cases in which a genus is based upon erroneously determined species. Out of a very voluminous correspondence and protracted discussion there was evolved the opinion "that as a specimen is the type of a species, so a species is the type of a genus, and hence when an author names a particular species as type of a new genus it is to be assumed that it has been correctly determined. If a case should present itself in which it appears that an author has based his genus upon certain definite specimens rather than upon a species it should be submitted to the Commission for consideration."

In view of the impracticability of invoking the opinion of the Commission at this time and in view of the manifest impropriety of making *Gobius mystacinus* Cuvier and Valenciennes the genotype of *Waitea* on the basis of a specimen of another species incorrectly so identified, it is herein proposed to recognize and validate the genus *Waitea* as having as its genotype the particular and only species that Jordan and Seale had before them when they established the genus. This species has been heretofore unnamed and is here described as new from specimens in the U. S. National Museum.

Waitea stomias, new species (Gobiidae)

Waitea mystacina (Cuvier and Valenciennes) Jordan and Seale, 1906, p. 407, fig. 94; Samoa. (Not *Gobius mystacinus* Cuvier and Valenciennes.)

Waitea mystacina (Cuvier and Valenciennes) Jordan and Richardson, 1908, p. 279; Luzon, Philippine Islands. (Not *Gobius mystacinus* Cuvier and Valenciennes.)

Waitea mystacina (Cuvier and Valenciennes) Herre, 1927, p. 208; Panay, Philippine Islands. (Not *Gobius mystacinus* Cuvier and Valenciennes.)

Waitea mystacina (Cuvier and Valenciennes) Koumans, 1935, p. 133; (*Gobius mystacinus* Cuvier and Valenciennes, in part.)

Description.—Elongate; body rather strongly compressed, its depth 4.8 in standard length; caudal peduncle rather slender, its least depth 2 times in depth of body, 3 in length of head, and 1.75 in its own length; head large, moderately compressed, its length 3.2 in standard length, its width 2 in its length and 0.8 its depth; snout 2.75 in head, rather strongly decurved; eye 1.6 in snout, 4.5 in head; interorbital space narrow, less than 0.5 eye; mouth large, slightly oblique, upper lip broad; maxillary extending to posterior edge of preopercle, 1.4 in head and as long as head less snout; teeth in each jaw in a narrow band of about four rows, the outer row enlarged; tip of tongue obtusely rounded; gill openings restricted, extending forward under middle of opercle, the isthmus somewhat wider than the eye.

Squamation: Scales weakly ctenoid, 27 in longitudinal series, 7 or 8 in transverse series, 12 circumpeduncular; nape, predorsal area, opercles, check, breast, and base of pectoral naked.

Fins: Dorsal rays VI–I,10; dorsal spines long, flexible, increasing in length from first to fifth, fifth as long as head; interdorsal space short, 0.3 eye; second dorsal base as long as head, the posterior rays reaching on caudal when depressed; caudal fin lanceolate, 1.5 times head and 0.5 combined length of head and body; anal similar to second dorsal, rays I,11; ventral fin long, reaching to anal; pectoral pointed, extending to opposite second branched ray of dorsal and anal fins, pectoral rays 19.

Coloration: Midside of body with five roundish black areas larger than eye, the last at base of caudal fin; back and side with small roundish black or dark brown spots in irregular disposition, top of head mottled with dark brown; rays of both dorsal fins with small black spots which form into irregular transverse lines; caudal with six broad, curved, dark cross bands; anal dusky; ventrals purplish black; pectorals plain.

Type.—The type, 7.4 cm in total length, was collected by Jordan and Kellogg in 1902 at Apia, on Upolu, one of the Samoan Islands. U.S.N.M. no. 51816.

Other specimens.—The U. S. National Museum contains two other specimens (nos. 99295 and 99296) taken in 1909 by an *Albatross* party in the Agus River near Camp Overton, Mindanao, Philippine Islands. These specimens, 6.7 and 6.5 cm long, agree very closely with the type in form and color, but have an increased number of scales in longitudinal series (29 and 31) and show some variation in the dentition, with the inner row of teeth in the upper jaw enlarged and with an anterior patch of teeth in the lower jaw curved canines.

Remarks.—As already indicated, this is the fish that Jordan and Seale misidentified as *Gobius mystacinus* of Cuvier and Valenciennes and made the genotype of *Waitea.*

Waitea stomias, as represented by the type from Samoa and the two specimens from Mindanao in the national collection, can not be the same species that Herre (1927) called *Waitea mystacina* and considered "unmistakably" represented in Jordan and Seale's figure. To show that Herre's two specimens 45 and 46 mm long from Iloilo are different it is necessary only to note

that the scales in longitudinal series are given by Herre as 36 or 38 (as against 27 in *stomias*), the scales in transverse series are stated to be about 16 (against 7 or 8 in *stomias*), the branched anal rays are given as 9 (against 11), and the shape of the first dorsal and caudal fins is entirely dissimilar.

Genus **Mahidolia** H. M. Smith

The genus *Mahidolia* was proposed by H. M. Smith (1932) for the accommodation of a Siamese estuarine goby thought to be new and given the name *normani* by Smith and Koumans in honor of J. R. Norman, of the British Museum. Several years later Koumans (1935), having examined the type of Cuvier and Valenciennes' *Gobius mystacinus* in the Paris Museum, concluded that *normani* from Siam is identical with *mystacinus* from Java. While accepting this conclusion I dissent from Koumans' various contentions (1) that *Mahidolia* is a synonym of *Waitea*, (2) that *Mahidolia normani* is identical with *Waitea mystacina* of Jordan and Seale, and (3) that the name *Waitea mystacina* of Jordan and Seale represents the same fish that Cuvier and Valenciennes called *Gobius mystacinus*.

It is remarkable that with all the revising that has been accorded the multicomposite genus *Gobius* (Linnaeus, 1758), the species *Gobius mystacinus* dating from 1837 should have remained untouched until a comparatively recent date and even then, in my opinion, should have been incorrectly allocated. As long ago as 1861 Günther said of *Gobius mystacinus* that "this species appears to be the type of a separate genus."

The proper name and synonymy of the genotype of *Mahidolia* are as follows:

Mahidolia mystacina (Cuvier and Valenciennes)

Gobius mystacinus Cuvier and Valenciennes, 1837, p. 124.—Günther, 1861, p. 48.
Waitea mystacina Herre, 1927, p. 208; in part.—Koumans, 1931, p. 67, in part; 1935, p. 133, in part.
Mahidolia normani Smith and Koumans, 1932, p. 256, pl. 23, fig. 1.

Comparison of Waitea and Mahidolia

In view of the uncertainty that has arisen with regard to the distinctness of *Waitea* and *Mahidolia*, there are presented comparisons of certain features in the two genera, and there are shown outline figures of the genotypes. These figures alone are conclusive evidence that *Waitea stomias* (= *Waitea mystacina* of Jordan and Seale and of Koumans) can not as claimed be the same fish as *Gobius mystacinus* of Cuvier and Valenciennes.

The squamation in described members of the two genera is quite different. In both the body is covered with weakly ctenoid scales and the head is scaleless, but in *Waitea* the breast is naked and in *Mahidolia* it is fully scaled. The scales in longitudinal series number 27 in *Waitea stomias* from Samoa but in specimens from the Philippines there are several more scales in that series; in transverse series the scales are 7 or 8. In *Mahidolia* from Siam the scales in longitudinal series number 40 to 45 and in transverse series 14 to 16.

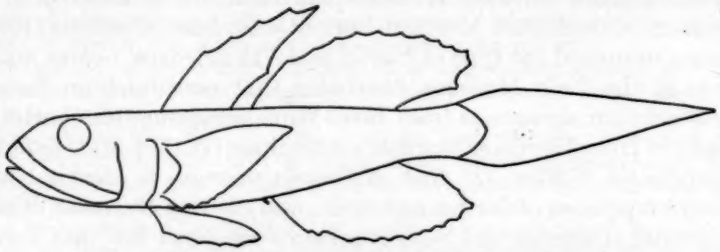

Fig. 1.—*Waitea stomias*, new species: The type specimen, from Samoa. Length, 7.4 cm.

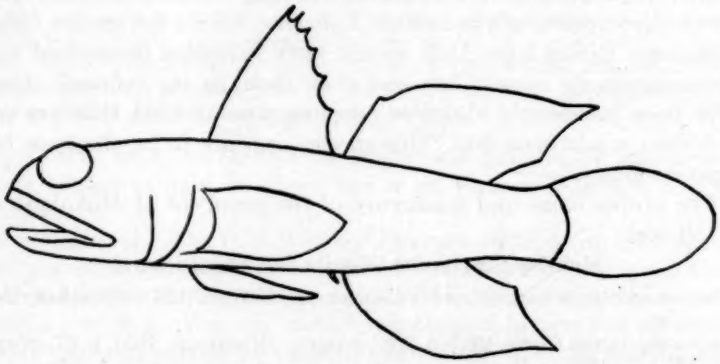

Fig. 2.—*Mahidolia mystacina* (Cuvier and Valenciennes): The type specimen of *M. normani*, from Siam. Length, 6.2 cm.

The dentition is not markedly different in the two genera. The teeth in both jaws are in about four rows, with the median teeth minute. In *Waitea* the outer row of teeth in both jaws are enlarged and approach caninoid, and the inner teeth in the upper jaw may be slightly enlarged or small. In *Mahidolia* only the outer teeth in both jaws are somewhat enlarged.

The size of the gill openings is another point of difference. In *Waitea* these are quite restricted, extending forward to a point oppo-

site the base of the ventral fins; and the isthmus is correspondingly wide. In *Mahidolia* the gill openings extend well forward to a point under the anterior margin of the preopercle, or about half the distance between the posterior edge of the opercle and the eye; and the isthmus is correspondingly narrow.

As regards the fins, there are entirely different types of spinous dorsal and caudal fins in the two genera. In *Waitea* the length of the spinous rays *increases* gradually from the first to the fifth, the sixth being the shortest. In *Mahidolia* the length of the spinous rays *decreases* gradually from the first to the sixth. The caudal fin in *Waitea* is very long, lanceolate, and sharp-pointed; its length is half the combined length of head and body. The caudal fin in *Mahidolia* is obtusely rounded, its depth two-thirds its length, and its length less than one-third the combined length of head and body.

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MYCOLOGY.—*Descriptions of* Elsinoë dolichi, *n. sp., and* Sphaceloma ricini, *n. sp.*[1] ANNA E. JENKINS, U. S. Department of Agriculture, Washington, D.C., and C. C. CHEO, National Tsing-hua University, Kunming, China.

Descriptions of two new species of Myriangiales are contained in an unpublished paper by Cheo and Jenkins.[2] The first is a species of *Elsinoë* on hyacinth bean (*Dolichos lablab* L.) for which the name *E. dolichi* is proposed. The other is on castor bean (*Ricinus communis* L.), and this is described under the name of *Sphaceloma ricini*. Both species were under study by the senior author when they were discovered in China, as explained in the paper. The first one had also been studied cooperatively with A. A. Bitancourt, of the Instituto Biologico, São

[1] Received June 24, 1941.
[2] CHEO, C. C. and JENKINS, ANNA E. *Diseases caused by* Elsinoë *and* Sphaceloma *discovered in Yunnan, China*. Contribution presented by the senior author at the celebration on April 18, 1940, of the 30th anniversary of the National Tsing-hua University, Kunming, Yunnan, China.

Paulo, Brazil. Because of the unavoidable delay that will be occasioned necessarily in the publication of the complete article, the Latin diagnosis[3] of the two new species is made available here as follows:

Elsinoë dolichi Jenkins, Bitancourt, and Cheo, n. sp.

Maculae in foliis interdum in superficie sola primo infecta distinctae, pallide alutaceae, interdum castaneo-marginatae, saepe margine elevatae, plus minusve nervisequentes, aliquando per laminam contiguam leniter extensae, saepe orbiculares, usque 4 mm in diam.; cancri in petiolis caulibusque ex orbicularibus ellipticales vel elongati, minuti usque 1 cm longi, 3 mm lati, plani vel depressuli, saepe margine elevati, pallidi, interdum flavido-vel prominenter atro-purpureo-marginati, in siliquis plus minusve orbiculares punctati usque circa 5 mm in diam., generaliter brunnei vel purpureo-brunnei vel centro pallescentes; ascomata amphigena, in superficie primo infecta abundioria e sub cortice fusco superficiali oriunda, e massis pseudostromaticis ex hyalinis flavidulis composita, plerumque pulvinata, saepe erumpenia, aliquando fere superficialia, 60–300μ in diam., usque 100μ lata, saepe coalescentia vel saltem propinqua; asci inspersi, in stratis uno vel pluribus, immaturi subglobosi usqua pyriformes vel ellipsoidei, 20–32μ alti, 15–22μ lati, in maturitate probabiliter majores; ascosporae immaturae, 1–3 septatae, hyalinae, 7–13μ longae, 3–5.2μ latae conidiophora superficiem corticis fuscae plus minusve continenter tegentia, paulo abrupte attenuata, 10μ alta, basi 3.6–5.3μ lata; conidia in herba sparsa, elliptica, minuta usque 3.5 mm in diam., in culturis globosa, 2.5–3.5μ in diam., usque ellipsoidea, 3–4.6μ longa, 1.5–1.8μ lata, hyalina.

DISTRIBUTION: On leaves, stems, and pods of hyacinth bean (*Dolichos lablab* L.), causing the disease termed "scab of hyacinth bean," Kenya and Uganda, Africa, and Yunnan, China.

SPECIMENS EXAMINED: Serere, Uganda, Africa, September 17, 1930, D. C. Edwards. Type (Mycological Collections of the Bureau of Plant Industry, Washington, D. C., no. 72652; Phytopathological Herbarium, Instituto Biologico, São Paulo, Brazil, no. 3267; and Imperial Mycological Institute, Kew, Surrey, England).

Yunnan, China, November 10, 1938, C. C. Cheo.

Sphaceloma ricini Jenkins and Cheo, n. sp.

Maculae in lamina foliorum plerumque e superficie superiore oriundas, orbiculares vel suborbiculares, papyraceas, saepe 2–3 mm in diam., in nervis subcontinuas, verruciformes, interdum per laminam contiguam extensas, in periolis caulibusque elliptico-elongatas, saepe utrinque aciminatas, primum rubro-brunneas, deinde luteas vel albas et brunneo-vel atropurpureo-marginatas producens; conidiophora in cancros conspicua, nunc in palum compactum flavidulum vel succineum, interdum partem centralem maculae tegentem, nunc separata vel sola, subuliformia vel cylindrica, plerumque simplicia, continua vel uniseptata, ex hyalinia usque flavidula, 10–30μ longa, 3–5μ lata, glabra vel e generatio acropleurogena conidiorum apiculata, breviter vel longe acuminata; conidia in forma, magnitudine coloreque varia-

[3] Acknowledgment is here made to the Imperial Mycological Institute, Kew, Surrey, England, for the contribution of material from Uganda of the first fungus described. Similarly, for the material from Formosa of the second species described acknowledgment is made to Dr. K. Sawada, Taihoku Imperial University. This material was sent directly to the senior author.

bilia, plerumque oblonga, ovoidea, elliptica, e minuta (1–2μ) usque 10–15 longa, 2.5–4.5μ lata, minoria hyaline, majoria fusiformia, saepe flavidula.

DISTRIBUTION: On leaves and stems of castor bean (*Ricinus communis* L.), causing the disease termed "scab of castor bean," Taihoku, Formosa (Taiwan) and several localities in Yunnan, China.

SPECIMENS EXAMINED: Taihoku, Formosa, July 2 (type) (Mycological Collections of the Bureau of Plant Industry no. 72921) and August 1938, K. Sawada.

Ta-chong station, Yunnan, China, December 1938, T. F. Yu, T. H. Wang, and S. T. Chao; August 1939, C. C. Cheo; Gee-kai station, Yunnan, June 1939, C. C. Cheo.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ACADEMY

368TH MEETING OF THE BOARD OF MANAGERS

The 368th meeting of the Board of Managers was held in the Library of the Cosmos Club on Friday, May 16, 1941. President CLARK called the meeting to order at 8:12 P.M., with 14 persons present as follows: A. H. CLARK, F. D. ROSSINI, H. S. RAPPLEYE, W. W. DIEHL, J. H. HIBBEN, F. C. KRACEK, H. B. COLLINS, JR., H. E. MCCOMB, M. C. MERRILL, W. RAMBERG, J. R. CHRISTIE, C. L. GARNER, and by invitation, R. J. SEEGER.

The minutes of the 367th meeting were read and approved.

President CLARK announced the appointment of C. L. GARNER to continue as Chairman of the Committee on Meetings until June, 1942.

The Executive Committee, through the President and Secretary, reported on a meeting held by them on May 6, 1941, at which they received from the Committee to Survey the Academy's Investment and Deposits, H. S. RAPPLEYE (chairman) and A. T. MCPHERSON, a report summarizing the present status of the Academy's investments and deposits and recommending that the savings account of nearly $8,500 be discontinued, since it was producing a return of only about 1 percent, and that the Academy place on deposit in investment accounts with two Federal Savings and Loan Associations, in which the principal amount of each account is insured up to $5,000, the sum of $8,500, with $4,500 in one and $4,000 in the other.

The Board authorized the Committee on Meetings to arrange for a meeting in September if they felt it desirable.

The Committee on Membership, F. C. KRACEK, chairman, presented a nomination for membership for one resident person.

The Board considered individually and duly elected to membership the seven persons (six resident and one nonresident) whose nominations had been presented on March 14, 1941.

The Committee to Publish the Directory for 1941 reported that plans were under way to publish the Directory in accordance with the recommendations made by the Board at its previous meeting.

The Secretary presented the following information concerning changes in membership: Deaths, 2; acceptances to membership, 5; qualified for membership, 9 (resident); retirements, none; resignations, none. The status of the membership as of March 15, 1941, is as follows:

	Regular	*Retired*	*Honorary*	*Patrons*	*Total*
Resident	428	35	3	0	466
Nonresident	128	15	14	3	160
Total	556	50	17	3	626

In accordance with instructions from the Board in January, the Board of Editors presented a report, through R. J. SEEGER, Acting Senior Editor, concerning their study of the desirability of changing the Journal to a 2-column format and recommended that such a change be made, as it would bring about an annual saving of about $200. The Board passed a resolution instructing the Board of Editors to issue the Journal with a 2-column format beginning with the first number of the 32d volume, in January, 1942.

The Board instructed the President to appoint a delegate to represent the Academy at the 175th anniversary celebration of Rutgers University, October 9, 10, and 11, 1941.

President CLARK addressed the Board on the subject of giving serious thought to the possible ways in which the Academy might better fulfill its obligations as the leader of science in Washington, and asked each member of the Board to consider this problem and to make appropriate recommendations at the first meeting of the Board in the fall.

The meeting adjourned at 9:33 P.M.

FREDERICK D. ROSSINI, *Secretary*

CHEMICAL SOCIETY

528TH MEETING

The 528th meeting (57th annual meeting) was held in the auditorium of the Cosmos Club on Thursday, January 9, 1941, at 8:15 P.M., President HALLER presiding. The annual reports of the officers and committee chairmen for 1940 were read and approved. Dr. WILLIAM J. SVIRBELY was elected Councilor to fill the office vacated by the resignation of Dr. G. E. F. LUNDELL, who had recently been elected to the office of Councilor-at-Large in the National Society. The Society was addressed by the retiring-president, Dr. RAYMOND M. HANN, who spoke on the subject *Some observations on the Walden inversion in the sugar series.*

529TH MEETING

The 529th meeting was held in the Auditorium of the Cosmos Club on Thursday, February 13, 1941, at 8:15 P.M., President HALLER presiding. It was announced that Dr. F. G. BRICKWEDDE, of the National Bureau of Standards, was to be awarded the Hillebrand Prize for 1940 for his outstanding work on deuterium and its compounds. The Society was addressed by Prof. WILLIAM MANSFIELD CLARK, of the Department of Physiological Chemistry, Johns Hopkins University, who spoke on the subject *Metalloporphyrins.*

530TH MEETING

The 530th meeting was held in the Auditorium of the Cosmos Club on Thursday, March 13, 1941, at 6:30 P.M. The occasion was the annual banquet of the Society at which about 110 members and guests were present to celebrate the awarding of the Hillebrand Prize to Dr. F. G. BRICKWEDDE, of the National Bureau of Standards, for his excellent work on deuterium and its compounds, with special reference to the preparation and determination

of properties of hydrogen deuteride. President HALLER acted as toastmaster. Dr. HANN spoke a few words on the work of Dr. BRICKWEDDE. The speaker of the evening was Prof. H. C. UREY, of Columbia University, who spoke on the differences in the Raman spectra of the isotopic deutero modification of methane. Professor UREY in his talk praised the work of Dr. BRICKWEDDE and considered him well worthy of the award which he had received.

531ST MEETING

The 531st meeting was held in the Auditorium of the Cosmos Club on Thursday, April 3, 1941, at 8:15 P.M., President HALLER presiding. Following the routine business, the Society was addressed by Dr. W. ALFRED LA LANDE, JR., director of research, Attapulgus Clay Co., who spoke on the subject *Some industrial applications of mineral adsorbents.*

532D MEETING

The 532d meeting was held jointly with the Washington Chapter of the American Institute of Chemists in the auditorium of the Cosmos Club on Thursday, April 10, 1941, at 8:15 P.M. In the absence of President HALLER, Secretary BEKKEDAHL acted as Chairman. After a few words by Dr. A. H. WARTH, chairman of the Washington Chapter of the American Institute of Chemists, and by F. O. LUNDSTROM, Chairman of the Washington local cooperating committee of the Chemist Advisory Council, the Society was addressed by FRANK G. BREYER, of Singmaster and Breyer, consulting metallurgists and chemical engineers of New York City, who is a member of the Board of Directors of the Chemist Advisory Council, Inc. He spoke on the subject *The activities of the Chemist Advisory Council, Inc.* Mr. BHAGWAT, Secretary of the Council, also spoke briefly on the organization and accomplishments of the Council.

533D MEETING

The 533d meeting was held at the University of Maryland, College Park, Md., on Thursday, May 8, 1941. A dinner was held in the University Dining Hall at 6:30 P.M. At 8:15 P.M., the general meeting took place in Room A-1 of the Arts and Science Building, President HALLER presiding. Following the completion of routine business, the following communications were presented in four sections:

Biochemistry, DR. M. HARRIS, *presiding*

HUGO BAUER, National Institute of Health: *Synthesis of organic phosphorus compounds of interest in chemotherapy.*

SANFORD M. ROSENTHAL, National Institute of Health: *Some relations of structure and pharmacological behavior to chemotherapeutic action.*

J. P. GREENSTEIN and ALEXANDER HOLLAENDER, National Institute of Health: *Physical changes in thymonucleic acid induced by salts, proteins, and ultraviolet irradiation.*

L. A. SHINN and B. H. NICOLET, Bureau of Dairy Industry: *Determination of methylpentoses in the presence of pentoses.*

Inorganic and Analytical Chemistry, DR. C. E. WHITE, *presiding*

CLEMENT J. RODDEN, National Bureau of Standards: *Spectrophotometric determination of praseodymium, neodymium, and samarium.*

HUBERT W. LAKIN, Division of Soil Chemistry and Physics, U. S. De-

partment of Agriculture: *Selenium in pyritic mine slimes as a potential agricultural hazard.*

A. GEORGE STERN, U. S. Bureau of Mines: *Fluorescent lighting—its mineral chemistry and dramatic uses.*

Organic Chemistry, DR. R. P. JACOBSEN, *presiding*

W. T. HASKINS, RAYMOND M. HANN, and C. S. HUDSON, National Institute of Health: *A synthesis of the epimer of cellobiose.*

F. B. LAFORGE and S. F. ACREE, JR., Bureau of Entomology and Plant Quarantine: *The reaction of some allenes with lead tetracetate.*

J. R. SPIES, Bureau of Agricultural Chemistry and Engineering: *The chemistry of cottonseed allergens.*

Physical Chemistry, DR. F. O. RICE, *presiding*

B. J. MAIR, A. R. GLASGOW, JR., and F. D. ROSSINI, National Bureau of Standards: *Separation of hydrocarbons by azeotropic distillation.*

A. L. SKLAR, Catholic University of America: *Mechanism of auxochrome effects.*

534TH MEETING

The 534th meeting was held in the auditorium of the Chemistry Building of the Catholic University of America on Thursday, May 22, 1941, at 8:15 P.M., President HALLER presiding. Following the routine business, the Society was addressed by Prof. PETER DEBYE, Head of the Department of Chemistry, Cornell University, Ithaca, N. Y., who spoke on the subject *Analysis of molecular structure by electron scattering.*

NORMAN BEKKEDAHL, *Secretary.*